DOCUMENT RESUME

ED 184 683 PS 011 323

TITLE Nutrition Education, Manual for Teachers. Health Education: Physical Dimension of Health.
INSTITUTION New York State Education Dept., Albany. Bureau of School Health Education and Services.
PUB DATE 79
NOTE 122p.: For related documents, see PS 011 321-323.

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Curriculum Guides: *Eating Habits; Elementary School Students: *Elementary Secondary Education: Health Education: *Nutrition: *Nutrition Instruction; *Physical Development: Secondary School Students: Teaching Guides

ABSTRACT

This teachers' manual provides nutrition information and guidance to facilitate nutrition learning experiences for children and youth. The manual is organized into six parts as follows: Parts one through four provide teachers of primary and intermediate grades, and junior and senior high school with an overview of nutrition education, the goals that teachers should strive to achieve, and basic nutrition concepts and understandings that the learners should develop. These are presented separately for each of the four grade levels. Part five, "Essential Nutrition Information," provides teachers with the basic nutrition facts the teacher needs to teach effectively and to deal adequately with the questions that the learners are likely to ask. Part six, the Appendices, provide: (1) a listing of sources of books and other literature, and learning/teaching aids that the teacher will find useful for detailed discussions about the ideas presented in the manual and that can be used to motivate and enhance learning, (2) summaries of some common misconceptions about food, (3) a summary of "dietary goals" for the U.S. (Author/SS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED184683

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

HEALTH EDUCATION
PHYSICAL DIMENSION OF HEALTH

NUTRITION EDUCATION

MANUAL FOR TEACHERS

The University of the State of New York
The State Education Department
Bureau of School Health Education and Services
Albany, New York 12234
1979

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
New York State Education Dept.
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

PS011323

THE UNIVERSITY OF THE STATE OF NEW YORK
Regents of the University (with years when terms expire)

1981 Theodore M. Black, A.B., Litt.D., LL.D., Pd.D., D.C.L., L.H.D., Chancellor ---------- Sands Point

1988 Willard A. Genrich, LL.B., L.H.D., LL.D., Vice Chancellor ---------- Buffalo

1986 Kenneth B. Clark, A.B., M.S., Ph.D., LL.D., L.H.D., D.Sc. ----- Hastings on Hudson

1983 Harold E. Newcomb, B.A. ---------- Owego

1982 Emlyn I. Griffith, A.B., J.D. ---------- Rome

1983 Mary Alice Kendall, B.S. ---------- Irondequoit

1984 Jorge L. Batista, B.A., J.D., LL.D. ---------- Bronx

1982 Louis E. Yavner, LL.B. ---------- New York

1986 Laura B. Chodos, B.A., M.A. ---------- Vischer Ferry

1980 Martin C. Barell, B.A., I.A., LL.B. ---------- Kings Point

1981 Joseph R. Bongiorno, B.S., M.D. ---------- Brooklyn

1984 Louise P. Matteoni, B.A., M.A., Ph.D. ---------- Bayside

1981 J. Edward Meyer, B.A., LL.B. ---------- Chappaqua

1985 Arlene B. Reed-Delaney, B.A., M.D. ---------- Albany

1987 R. Carlos Carballada, B.S. ---------- Arcade

President of the University and Commissioner of Education
Gordon M. Ambach

Executive Deputy Commissioner of Education
Joseph J. Blaney

Deputy Commissioner for Elementary, Secondary, and Continuing Education
Robert R. Spillane

Assistant Commissioner, Office of Educational Finance, Management and School Services

Director, Division of Physical Education, Fitness, Health, Nutrition and Safety Education

Chief, Bureau of School Health Education and Services
Frances A. Bernstein

ACKNOWLEDGEMENTS

We are grateful for the technical assistance provided by the large number of nutritionists who volunteered their time and expertise to refine this document. We wish to acknowledge the staff of the Division of Nutrition Science, The College of Human Ecology, Cornell University, Martha Mapes, Division Extension Leader; the Regional Nutritionists of the New York State Department of Health, Carlene Millican, Rochester Regional Office, Elizabeth Lund, White Plains Regional Office, Margaret Simpson, Syracuse Regional Office, and Mary McInerny, Albany Regional Office; Virginia Sargent, Nutritionist of the Bureau of Nutrition of the New York State Department of Health. Also providing invaluable technical advice were Marcella Guiney, Executive Director, The Dairy Council of Metropolitan New York, Inc., Grace Hilt, Program Coordinator, The Dairy, Food and Nutrition Council, Inc., and Catherine Cowell, Director, Bureau of Nutrition, the Department of Health, the City of New York.

In addition, the manuscript was reviewed by the Bureau of School Food Management and Nutrition, Richard Reed, Bureau Chief; the Bureau of Home Economics Education, Elizabeth Brown, Bureau Chief; and the Bureau of General Education Curriculum Development, Herbert Bothamley, Bureau Chief; all of the New York State Education Department.

Many elementary school teachers and secondary school health educators were also consulted, especially in regard to the application of the guide to the educational process within schools. Among those deserving special acknowledgement are Harvey Bien, Supervisor of Health Education, District #10, New York City; Zenon Deputat, Health Educator, Payne Junior High School, North Tonawanda; Jeanette Dippo, Health Educator, Cortland Senior High School; Andre Fontain, Health Coordinator, Suffern School District; Edward Griesmer, Teacher, Central Park Middle School, Schenectady; Andrew Kunkel, Teacher, Denton Avenue Elementary School, Herricks; Jamie Rattray, Health Educator, Corning Free Academy Middle School; Helen Macko, Health Educator, Binghamton City School District.

Finally, we are grateful to Donna Sorensen who prepared the first draft of the informational section of the manuscript.

The entire project was under the direction and supervision of Albert E. Bedworth, Associate in School Health Education, The Bureau of School Health Education and Services, The State Education Department, who also edited the manuscript and prepared it for publication.

TABLE OF CONTENTS

	Page
Acknowledgements	ii
Preface	1
Introduction	2
Aim of Nutrition Education	4
Goals of Nutrition Education	5
Purpose and Use of the Curriculum Guides	7
PART ONE	
Nutrition Education for the Primary Grades	9
Overview	10
Teacher's Goals	11
PART TWO	
Nutrition Education for the Intermediate Grades	13
Overview	14
Teacher's Goals	15
PART THREE	
Nutrition Education for the Junior High School	17
Overview	18
Teacher's Goals	19
PART FOUR	
Nutrition Education for the Senior High School	21
Overview	22
Teacher's Goals	23
PART FIVE	
Essential Nutrition Information for Teachers	25
Evolution of Food	26
What Is Food?	26
Prehistoric	26
Beginning of Agriculture	26
Importance of Grains	27
Expansion of Agriculture	27

	Page
Effects of the Need for Food on Societies	29
Introduction	29
World Explorations	29
Eating Behavior	31
Food Habits	31
Food Preferences	32
Food and the Senses	32
Psychological Influence	33
Cultural Influences	33
Body Image and Food	33
Economic Factors	34
Fast Food Service	34
Advertising	34
Nutritional Quackery	34
Some Food Myths	36
Food for Maintenance, Energy, and Growth	37
Food Is the Source of Specific Nutrients	37
Vitamins	37
Minerals	37
Protein Quality	44
Energy	44
Breakfast	47
Digestion and Absorption	47
How Food Affects Growth and Development	49
Introduction	49
Cells and Their Need for Nutrients	49
Changing Nutrients Into Energy and Building Materials	50
The Role of Food	50
Growth During Adolescence	52
Developmental Age	52
Physiological Homeostasis	53
Effects of Nutrition on Health	55
Introduction	55
Whose Responsibility Is Nutrition?	55
Criteria for Assessing Dietary Adequacy	56
A Balanced Diet	56
The Basic Four Food Groups	57
Nutrient Density	58
Measurement of Nutritional Status	59
Nutrient Deficiencies	60
Nutrient Excesses	60
Achieving and Maintaining the Best Weight	62
Normal Weight Factors that Affect Body Weight	62
Weight versus Fatness	63
Evaluation of Weight Status	64
Health Implications of Obesity	64
Dealing With Overweight	64

	Page
Adequacy of Teenager's Diet	66
Typical Diet	66
Nutritional Concerns of Teenagers	66
Studies of Teenagers' Nutritional Status	67
Fad Diets	68
Anorexia Nervosa	69
Nutrition During Phases of the Reproductive Cycle	70
Preconceptual Period	70
Interconceptual Period	70
Pregnancy	71
Importance of Prenatal Diet to the Mother	72
Teenage Mothers	73
Lactation and Infant Nutrition	74
Nutritional Needs of the Infant	75
Food Ecology	77
Technology	77
Government Regulations	77
Food Labeling	78
Safe Food Supply	79
Additives	81
Nutrition Problems In the United States	82
Owen Study	82
Hunger and Malnutrition	82
Concern for the Nutrition of Poor Americans	83
Obesity	84
Atherosclerosis and Coronary Heart Disease	85
National Nutrition Survey	88
Programs to Improve Nutritional Well-being	89
Introduction	89
Food Stamp Program	89
Women, Infants, and Children Supplemental Food Program (WIC)	90
Expanded Nutrition Education Program (Federal Extension Service)	90
Child Nutrition Programs	90
Global Nutrition: Ecological Perspectives	92
Problems of Developing Nations	92
Population Growth	92
Urbanization	93
Economic Growth	93
Malnutrition in Children	94
Feeding the World's Population	96
The Role of International Agencies	96
World Food Conference	96
Domestic Resources	97

Page

Nutrition Research 99
Introduction 99
Methods 99
Areas of Current Investigation 100
Changes Needed in Food Selection and Preparation 104
Ongoing Research 104

PART SIX

Appendixes

A: Sources of Nutrition Education Materials 107
B: Some Common Misconceptions About Food and Nutrition 110
C: A Summary of the Dietary Goals for the United States 113

PREFACE

This teachers' manual should provide teachers with the essential nutrition information and guidance to *facilitate* nutrition learning experiences for children and youth. The manual is organized into six parts as follows:

- Parts one through four provide teachers of primary and intermediate grades, and junior and senior high school with an *overview* of nutrition education, the *goals* that teachers should strive to achieve, and basic nutrition *concepts and understandings* that the learners should develop. These are presented *separately* for each of the four grade levels.

- Part five, "Essential Nutrition Information," provides *teachers* with the *basic nutrition facts* the teacher needs to teach effectively and to deal adequately with the questions that the learners are likely to ask.

- Part six, "Appendixes" provide:

  -a listing of *sources* of books and other literature, and learning/teaching aids that the teacher will find useful for detailed discussions about the ideas presented in the manual and that can be used to motivate and enhance learning. It is important to recognize that this listing is intended as a "starter" for teachers. It is suggested that teachers work closely with the library media specialist and/or director of communications to identify other sources of aids not included in the list and to continuously update the list.

  -some common misconceptions about food. The teacher may want to expand this list as other misconceptions are identified by the learners. It is important to emphasize learning experiences that will replace these or other food misconceptions with factual nutrition information.

This manual and the *accompanying* curriculum guides have been developed with the philosophy that nutrition education should be an integral part of a comprehensive health education program. With this in mind, many essential nutrition areas will also be included in other health topics to which they are most closely related. For example, obesity that is related to compulsive eating may best be discussed in context with mental and emotional health, while the social implications may best be discussed within the sociological health dimension. In addition, *it is important that the teacher recognize the contributions that other school experiences can make to the nutrition education of learners.*

It is recommended that prior to teaching this health area, the teacher become familiar with the information in this manual and correlate it with the suggestions presented in the *accompanying* curriculum guides.

INTRODUCTION

Since many eating practices are established early in life, it is important that the nutrition education program emphasize nutritional patterns that contribute to the individual's welfare. It does little good to criticize or condemn harmful practices which may have been acquired. Rather, *learners should be given many opportunities to explore, experiment with, and experience good nutrition.*

Many of the health problems resulting from nutritional abuses have their origin in improper nutritional practices starting at birth and continuing through childhood. For example, the common *misconception* that fat babies are healthy babies frequently results in overfeeding of infants. This in turn may result in the development of excess fat cells which can become the basis for adult obesity. Children also are influenced in their eating behavior by the kinds of foods that the family generally serves. If these are excessive in "empty" calories, for instance, the child may be establishing food selection preferences that could be forerunners of obesity-related diseases later in life.

One of the most prevalent health problems in America today is obesity. It is usually the result of eating too much in relation to the individual's nutrient requirements. These requirements are essentially determined by the rate of growth and development, and activity of the person. When one takes in more calories than the body requires, the excess is stored as fat. Excessive stored adipose tissue over normal or "ideal" weight for body build is obesity.

Obesity is potentially a serious health problem because it is associated with several degenerative (sometimes fatal) diseases. For example, the obese person is likely to be susceptible to coronary heart disease and other diseases of the circulatory system. Obesity is also associated with a variety of emotional and social problems.

For individuals to overcome obesity, it is necessary for them to change their eating and/or activity patterns. They need to understand the circumstances surrounding the condition and the measures they must take to reduce their weight. Unfortunately, the obese person is vulnerable to the fad diets which can be dangerous if one follows the suggestions of the faddist completely, and they do little to help the person reduce permanently.

Health problems resulting from nutritional inadequacies and nutritional excesses are among our nation's most serious health concerns. The problems affect every dimension of human functioning; physical, psychological and social. The incidence of many of these health problems could possibly be reduced significantly by a change in the eating patterns of those affected, and the establishment of proper eating practices early in life.

Undesirable eating practices are generally the result of a lack of adequate and accurate nutrition information, the acquisition of nutritional misconceptions, and imitative behavior patterns developed early in life. Individuals who lack sufficient knowledge of nutrition are vulnerable to the food faddist and quack. They frequently fall prey to fad diets or other potentially harmful practices. For example, many people have been persuaded by the manufacturers of vitamins and minerals to take excessive quantities of vitamins daily.

In some cases such practices may result only in a waste of money. In other cases, the practice may be dangerous to health resulting in a condition known as hypervitaminosis. This is especially true with the ingestion of excessive amounts of vitamins A and D which are stored in the body.

The school should avoid criticism of family, cultural or ethnic eating practices. However, it is important for the school to reinforce healthful dietary practices and to introduce additional ones that can become a part of the learner's total nutritional repertoire. Experiences with unfamiliar foods or foods that are traditional in various cultures can help learners to become aware of new foods and make decisions about incorporating them into their diets.

The establishment of positive food attitudes and behavior during the childhood years will most likely stay with the children throughout life. As they grow toward maturity they will add to their nutrition knowledge and establish new attitudes and behavior that could promote their health and may help to prevent a variety of nutritionally related disorders.

AIM OF NUTRITION EDUCATION

Food is not only necessary for satisfying one of our most basic drives, hunger, but is vital for all aspects of human functioning. People concern themselves with food several times a day and the decisions that are made about the kinds and amounts of food eaten are directly related to their well-being. As the variety of foods available to us continues to increase, the ability to make intelligent choices among foods is of the utmost importance and becomes increasingly difficult.

Accurate nutrition knowledge is necessary to insure that important decisions concerning health are properly guided and not influenced by ignorance, faddist claims, or emotional factors. A nutrition education program which teaches the learner about human food needs, habits, and utilization is an important asset in this decision-making process. As the number of working mothers increases, children and youth must become more responsible for managing their own meals.

The nutritional practices of people are influenced by biological needs and psychological, social and cultural factors. Ignorance and the acquisition of misinformation about nutrition, foods, and diets contribute to poor nutritional practices of many people.

The aims of nutrition education programs are to promote healthful nutritional practices and to assist each person to overcome those personal or environmental factors that tend to interfere with the attainment of optimal nutrition.

GOALS OF NUTRITION EDUCATION

One's basic attitudes about food that direct nutritional behavior are learned early in life. Eating practices are highly complex and become more resistant to change as one matures. For nutrition education programs to be most effective, they must take into account the total makeup of individuals, as well as the impact that their physical and social environments have on their nutritional behavior. The goals for a nutrition education program are to:

1. provide learners with those experiences that will result in an understanding of the varieties of foods available for adequate nutrition and how to obtain and prepare them.

2. assist the learners to understand the relationship between the foods they eat and their growth, development and total functioning.

3. assist the learners to understand the environmental factors that influence their eating patterns.

4. provide opportunities to explore the variations in eating patterns between families and cultural groups.

5. eliminate misconceptions about foods and eating patterns.

6. motivate the learners to become more food conscious and to select nutritionally adequate diets.

7. assist the learners to understand that one's level of health and functioning is related in part to the food they eat.

8. assist the learners to establish food selection criteria based upon scientific findings.

9. assist the learners to understand why food fads can be harmful to growth and development.

10. provide learning experiences related to an understanding that different people may require different amounts of food but that all people require the same basic nutrients.

11. motivate the learners to become politically active in matters concerned with nutrition and health.

12. provide linkages with the school food services so that information taught will be more likely reinforced by the food served in the cafeteria.

13. understand the relationship between food and the nutrients needed by the body as influenced by selection, storage, preparation, and sanitation.

14. provide a communications system with the home about the information being taught to ensure reinforcement.

15. motivate learners to become conscious of food safety and the roles that individuals, food industries and the government play in assuring food safety.

PURPOSE AND USE OF THE CURRICULUM GUIDES

Description

The curriculum guides that *accompany* this teacher's manual have a two-column format, (1) learner activities and (2) teacher information. The learner activities column provides a variety of suggested learning experiences, which are intended to help achieve the learner *enabling* objective. The teacher information column provides the teacher with factual information related to the objectives and in anticipation of learner questions. It also provides the teacher with directions for facilitating the activity, resources that may enhance the learning experiences, and general information designed to assist the teacher to implement the activities.

In addition, the format includes the topic and sub-topic area being explored, the *terminal* objective and the *enabling* objectives related to it. The *enabling* objectives are learner-centered and stated in behavioral terms. The *terminal* objectives are more broadly stated than the enabling objectives. There are usually several enabling objectives stated for each terminal objective. Their purpose is to provide the learner and the teacher with the specific direction that learning should take. If the enabling objectives are achieved, the terminal objective will also be achieved.

Purpose and Use

The overall purpose of the *accompanying* curriculum guides is to provide teachers with the essential information necessary to implement an effective nutrition education program. The guides provide teachers with:

- o *essential factual nutrition information* related to the developmental level of the learners.
- o *a variety of learning experiences* from which to choose as they relate to the nutrition interests and needs of individual learners.
- o an effective *scope, sequence and progression* that will make learning easier, more exciting, and applicable to the nutrition behavior of the learners.
- o a list of *learner objectives* that not only serve as a guide for learning, but also a guide for ascertaining learner progress and program effectiveness.
- o essential information or *directions* necessary to efficiently and effectively implement the learning experiences selected.

The *accompanying* guides should be used as a curriculum aid. They are not intended to be a syllabus. Teachers should *select* those objectives that are most relevant for their learners and those learning activities that are most likely to assist the learners to achieve their objectives. However, it is important that within a school system, teachers work cooperatively to establish a sequential flow that builds awareness and understanding from grade to grade. Teachers should feel free to modify the suggested learning experiences to make them more appropriate to their individual learning environments and for their pupils. In addition, teachers should add learning experiences that they have previously used successfully. Teachers should integrate their own curriculum with nutrition education and coordinate learning experiences with the school food services program and the school health program.

PART ONE

NUTRITION EDUCATION
FOR THE PRIMARY GRADES

*** OVERVIEW ***

*** TEACHER'S GOALS ***

OVERVIEW

The nutrition curriculum for the *primary grades* is directed toward learners:

- o appreciating eating as a pleasurable experience.
- o beginning to understand the relation of food to health.
- o understanding the relation of food to human growth.
- o developing positive attitudes toward food.
- o being able to identify and differentiate foods and food sources.
- o developing interest in a wide variety of foods.
- o realizing that people eat in many different ways and in quite different circumstances.
- o clarifying their values toward food selections.
- o beginning to develop an appreciation of the rich resources and favorable conditions that exist in our country for producing and preparing food.

The effectiveness of nutrition education can be greatly enhanced if it is reinforced where the child's experiences with eating take place; the school lunch program, snacks in school, and meals in the home. It is fundamental to the success of nutrition education in the primary grades for the teacher to create situations in which the learner can succeed, develop self-direction, and become motivated. These issues are addressed in the suggested learning experiences presented in the *accompanying* curriculum guide.

Nutrition learning should take place within the context of the comprehensive health education program and the learning experiences should be incorporated into the learners' real life situations; such as the school lunch program, and the influence that the home has on eating. The selection of learning experiences should be based upon the learner's developmental level and motivation at this stage of life. Many learning experiences in nutrition education can be offered in conjunction with other disciplines; such as science, social studies, mathematics, or art.

TEACHER'S GOALS

Many eating patterns are firmly established by the time children enter school, and their general practices are likely to conform closely with those of their family and cultural heritage. It should be the purpose of the school to add a new dimension to the eating experiences of the child, and to reinforce those practices that contribute to the promotion of the child's health. The emphasis should be placed on the development of positive nutrition attitudes and behavior. Learning experiences which help children to behave in healthful ways are desirable.

The developmental characteristics of children should form the basis for the teacher's role in nutrition education. Some of the developmental characteristics that will influence learning and the kinds of learning experiences that are likely to be effective are:

1. Physical Growth

   Proper nutrition is very important during periods of physical growth. The prenatal period is the time of most rapid growth. Following birth there is a significant decrease in the growth rate. Although children in the primary grades have reached more than two-fifths of their adult size, they are still developing rapidly. Even though all children generally follow a similar growth pattern each child develops at his/her individual rate. The growth rate gradually decreases during the early years until a plateau is reached at about the age of six or seven. During the adolescent period the rate of growth accelerates again.

2. Attitudinal Development

   Children are influenced greatly by the behavior of others. Positive examples that they can emulate are important as learning experiences during these developmental years. Their perception of themselves, others, and the world in general are forming the basis for their attitudinal structure which will in turn influence their behavior. Appropriate socializations become an important part of their lives. Socializing experiences may provide opportunities for exploring new forms of eating patterns.

3. Value System Formation

   A child's value system is being formed at this time. Children are learning their roles as individuals and developing a sense of independence. This results in the increasing ability to make personal choices about their own behavior.

4. Self-Concept Changes

Children are receptive to new and exciting challenges in which they perceive the chance for success. Changes are taking place in their self-concept as a result of wider associations with others and their exposure to new experiences. Children are influenced greatly by affective educational approaches which challenge all of their senses.

These and many other factors should be considered when the teacher is establishing nutrition education goals. These goals should include the following:

1. To provide learners with a variety of nutritional experiences not easily encountered outside of school.

2. To provide learning experiences that actively involve the children with opportunities to explore, do, succeed, and fail.

3. To provide learning experiences that stimulate the senses of touch, taste, smell, sight, and hearing.

4. To provide learning experiences in sharing their nutritional ideas, attitudes, and actions with peers.

5. To stimulate interest in food and eating.

6. To provide learners with nutritional guidance and examples for learning success.

7. To assist learners to view nutrition in perspective with other life experiences.

8. To develop understanding of the relation of food to growth and development, and actualization of potentials.

9. To assist learners to evaluate the nutritional information available through the media, advertising, and word of mouth in order to provide a basis for food selection.

10. To provide opportunities for cooperating with food providers.

PART TWO

NUTRITION EDUCATION FOR THE INTERMEDIATE GRADES

*** OVERVIEW ***

*** TEACHER'S GOALS ***

OVERVIEW

Nutrition education is a continuous process with new food experiences taking place almost daily. The school should supplement out-of-school experiences whenever possible, and, in addition, provide new experiences that the learner is unlikely to have outside of school.

Learning experiences in the intermediate grades should be consistent with those experiences offered in the primary grades, but should avoid duplicating them. In this regard, nutrition education should be progressive, building upon the understandings the learner has acquired, reinforcing the desirable ones, and eliminating the misconceptions that may have developed. In addition, nutrition education should open up new eating experiences for the learner.

The suggestions contained in the *accompanying* curriculum guide for the intermediate grades places major emphasis upon:

- o helping the learner discover further how foods have evolved.
- o how foods have influenced the history of humanity.
- o how eating behavior is influenced by the environment, religion, and culture.
- o how social and psychological factors influence eating patterns.
- o how food is digested, absorbed, and used by the body.
- o how food is related to health and total functioning.
- o the importance of using objective criteria in food selection.
- o how and why the foods people eat are an integral part of their physical and sociocultural environments.
- o providing the learner with further opportunities to clarify food preferences.

The study of foods and nutrition should revolve around much more than the learning of factual nutrition information. Learners should be provided with opportunities to experience what various kinds of food look, feel, and taste like. Also, some areas of study should be related to other disciplines, such as science and social studies. Interdiscipline approaches can add new and exciting dimensions and make learning meaningful and realistic. It is important for the learner to perceive nutrition as an integral part of all life's activities.

TEACHER'S GOALS

The intermediate grade teacher must possess certain basic nutritional competencies prior to implementing the nutrition education curriculum. These competencies should be directly associated with the teacher goals listed below which ultimately will be the facilitator for providing meaningful learning experiences for the intermediate grade pupils. The most basic competency, before the goals can be achieved, is an understanding of the fundamental, physical, psychological and social characteristics of children in the 10-to 12-year-old group. A review of some of these might be helpful.

1. Children between the ages of 10 and 12 years are demonstrating an increasing concern for recognition by their peers. They seek the approval of their peers in a variety of areas, such as dress, achievements, and other behaviors. These children tend to reject standards of adult society and of the home in favor of those of the peer group even though these are frequently closely allied with those of the home and society.

2. Rejection of home standards is seldom complete, and children will tend to fluctuate between the need to be independent and the need for dependency. This may result in inconsistent behavior in relations with their parents. The 10-to 12-year-old frequently becomes a member of a secret club whose members are intimate and dependent upon each other for advice and support. Feelings of frustration may result if the child becomes torn between loyalty to parents and loyalty to the peer group.

3. Independence is manifested through greater expressions of courage, expanded activities, exploration, and attempts to increase the boundaries of their environment. These children tend to be somewhat unconcerned about their own health unless it threatens their attempts to engage in these expressions. This is the age of menarche for many girls and can be a significant influence on their behavior. It is also a prime time for fat deposition for boys. Although they feel capable of dealing with their own problems of life, their lack of maturity in judgment may result in inappropriate behavior from time to time.

4. Children in grades 4 to 6 become increasingly interested in acquiring factual information. There is a strong desire to expand and demonstrate their intellectual abilities. They tend to be critical of dogma and demand proof of factual phenomena. In contrast, they tend to be susceptible to convincing propaganda that seems to satisfy their emotional needs.

Therefore, the goals that the intermediate grade teacher should achieve relative to nutrition education are:

1. To provide learning experiences which deal with the role that food has played, and continues to play, in shaping the history of the world's peoples.

2. To help learners appreciate the varieties of foods people eat, and how, when, and under what circumstances they eat those foods.

3. To help the learners understand how foods are digested and absorbed, and the significance of these processes to health.

4. To provide learning opportunities related to the role of the body and the importance of nutrition to its health.

5. To assist learners to comprehend the metabolism of nutrients.

6. To help learners appreciate the role of heredity and nutrition in growth and development of the individual.

7. To motivate learners to use appropriate criteria in selecting their nutrients.

8. To provide learning experiences which will distinguish between food facts and food myths.

9. To assist learners in analyzing advertising of foods through the media, as these relate to promoting the product rather than providing completely accurate information about the foods.

PART THREE

NUTRITION EDUCATION FOR THE JUNIOR HIGH SCHOOL

*** OVERVIEW ***

*** TEACHER'S GOALS ***

OVERVIEW

Nutrition education at the junior high school level should address the nutritional concerns of the early adolescent. These concerns are the direct result of the physiological, psychological and social changes that adolescents experience, and are based on changes in their perception of the environment and the impact of experiences they are encountering for the first time. For example, adolescents, especially girls, are generally experiencing a normal increase in weight. The problems surrounding this weight gain are realistic concerns of theirs and often lead to misguided decisions to diet. Further, the adolescent is becoming very vulnerable to fads of all kinds and is likely to engage in those related to nutrition in its broadest sense; vitamin pills, or diets promoted to increase muscular strength, to lose weight, to improve physical attractiveness, or to cure acne.

Nutrition education for adolescents should be directed toward providing them with opportunities to explore in much more detail the relationships among nutrition and health, disease, and physical growth and development. These experiences should be associated with and directed toward solving those nutritional concerns most prevalent in adolescence. The following are areas of nutrition that should be considered:

- The roles of heredity and environment in determining the individual's health status and growth potential as they relate to nutritional practices.
- The development of scientifically sound criteria to be applied to practical nutrition situations.
- The physical and emotional problems the adolescent is encountering as a result of maturation and its effects on nutritional practices.
- The role nutrition plays in determining body size and the facts about size comparisons.
- The ways that adolescents can analyze their own nutritional practices in relation to their own body composition and needs.
- The effect that food quackery can and does have on the well-being of people.
- The role of chemical additives in processed foods.

TEACHER'S GOALS

As with the primary and intermediate grade pupils, the characteristics of the junior high school pupils should be the foundation upon which the goals of the teacher should be based. A review of some of the common characteristics of early adolescence that are particularly associated with nutrition is provided below.

Generally, the 13-15-year-old has reached a stage of development characterized by a variety of confusions. These result from many sources; the accumulation of much information, some of which may be contradictory, the physiological changes taking place that affect not only the physical structures of the body, but also the psychological and social aspects of the early adolescent, and the necessary changes in satisfying certain basic physical and emotional needs. Specifically, the early adolescent is usually undergoing the following experiences:

1. There is an increase in the problems related to the development of their personality. These can be significant since many relate to diets and altered eating patterns. New food attitudes are forming and many established ones are being reinforced.

2. The early adolescent experiences many periods of uncertainty. This may manifest itself in worry and anxiety. Adolescents become more conscious of foods and are developing an interest in nutrition, especially as it relates to their basic physical and psychosocial concerns. Adequate nutrition experiences can do much to alleviate these emotional concerns and provide directions for better nutritional practices.

3. The 13-15-year-old is developing a strong desire to become more sophisticated, more knowledgeable and more mature. Peer acceptance is a powerful motivating force influencing the establishment of many new behavior patterns. There is the need for clarifying old ideas and values and establishing a basis for the formation of new ones. The 13-15-year-old also tends to imitate some adult behavior. They need guidance in choosing the behavior that is most likely to satisfy their basic needs. They need opportunities to discuss, clarify, explore, and experience. These can be effective in the establishment of a positive self-image.

4. Because 13-15-year-olds are experiencing new freedoms, they have more independence in making food choices outside of the home.

The goals that the teacher should strive to achieve are:

1. To assist learners to appreciate the relationships between nutrition and health.

2. To assist learners to appreciate the role that nutrition plays in maintaining physiological homeostasis.

3. To provide a variety of learning experiences that will result in the learners' understanding that nutritional needs for individuals vary throughout the life cycle.

4. To provide learning experiences that help clarify the roles that heredity and nutrition play in human growth and development.

5. To assist learners to identify the criteria to be used to assess their nutritional status and needs.

6. To assist learners to identify and use the criteria necessary for them to assess the adequacy of their food patterns and to make changes as appropriate.

7. To provide learners with opportunities to explore and understand their nutritional concerns and to help them to evaluate the role of their food patterns in this regard.

8. To assist learners to understand the physical and psychological risks associated with obesity.

9. To assist learners to comprehend the concept of "ideal" weight.

10. To provide learners with opportunities to explore the numerous environmental factors that influence their nutritional health.

11. To help learners to become more discriminating in the market place, whether it be the supermarket, vending machine, or fast food establishment.

PART FOUR

NUTRITION EDUCATION FOR THE SENIOR HIGH SCHOOL

*** OVERVIEW ***

*** TEACHER'S GOALS ***

OVERVIEW

For most senior high school students, this may be their final formal educational experience in matters concerned with nutrition. In this regard, it becomes vital that previous nutrition learning is clarified and that accurate nutrition information is thoroughly comprehended by each student. This will become the foundation for lifelong decisions about their own and their family's nutritional patterns. In addition, it is important that all students become familiar with the impact that nutritional practices have on their health in adult life. They should be motivated to seek further, accurate information as the need arises and to establish new nutrition attitudes and behaviors based upon this information.

Nutrition education at the senior high school level can become more effective when it capitalizes on the students' intense interest in, and awareness of, national and international events, and the students' growing concern for their future as a contributing member of society and their need to live independently. Opportunities should be made available for students to explore and analyze some of the controversial issues that surround many phases of nutrition and to discuss the significance of these to their welfare and that of others.

Since senior high school students are developing as adults and are becoming more aware of their ability to influence society's nutritional standards and policies, emphasis should be placed upon developing an understanding of:

- the extent and significance of hunger in the United States and the world.
- the kinds of nutritional problems present in developing nations and their political and social significance.
- the effects of affluence on nutritional practices.
- nutrition during the reproductive cycle including maternal, prenatal, postnatal and infant nutrition.
- the relationship of obesity to atherosclerosis and coronary heart disease.
- current nutrition research and the application of findings to the nutrition of people.
- the necessity to plan to meet their own nutritional needs within the budget of a salary of "first employment."
- evaluating the nutritional values of foods in terms of actual cost.

TEACHER'S GOALS

Adolescence has been described as a transitional period from childhood to adulthood. This is characterized by the establishment of a unique youth culture with a variety of subcultures. The combination of the biological changes still taking place and the psychosocial urges and demands results in numerous behavior patterns some of which are constructive, some destructive, and some conflicting. These are generally manifested in the following ways:

1. Because of the marked physical growth and physiological changes taking place, the adolescent is often awkward. This may result in embarrassment and self-consciousness. Food may play a role in attempts at overcoming these feelings.

2. Young adults are very concerned about their general appearance. Blemishes, such as acne, become extremely significant. In addition, they are concerned about the image they project to their peers. Physical and social concerns have become interactional which in turn, influence the adolescent's mental and emotional expressions. The adolescent is vulnerable to food faddism, as well as a variety of other fads.

3. Adolescents are developing new insights into their roles as family members. These frequently result in periods of anxiety.

4. The psychosocial changes result in intense concerns about sex roles, and relationships with peers and the opposite sex.

5. Behavior is sometimes erratic. Adolescents are undergoing physical, emotional and social maturation. This process motivates the need to explore and to experiment, which may be manifested at times in bizarre behavior. They develop an intense concern about themselves as they struggle to develop an identity, an acceptable self-concept. They strive for peer acceptance.

6. Adolescents are developing a keen interest in the world and ways in which they can make it better. As they mature, they become more concerned about the welfare of others and ways in which they can contribute to improving society.

Nutrition education at the senior high school level should build upon the understandings developed earlier and take advantage of the changing behavior characteristics of the adolescent. Therefore, the teacher of nutrition should emphasize the achievement of the following goals:

1. To assist learners to appreciate the problems associated with feeding the world's population and the new problems likely to arise as the population of the world increases.

2. To assist learners to understand the nutrition problems that exist in the developing nations of the world and the role that the technologically advanced nations must play to alleviate them.

3. To provide learners with opportunities to explore the causes and kinds of malnutrition problems of children and the effects they have on physical, mental and emotional development and social interactions.

4. To provide learners with opportunities to acquire insight into the extent of hunger and malnutrition in the United States.

5. To provide learners with opportunities to analyze the programs in the United States that are intended to combat malnutrition among poor Americans.

6. To assist learners to understand the nutrition problems of affluent societies, especially those related to obesity, atherosclerosis, and heart diseases.

7. To assist learners to understand the importance of proper nutrition during the phases of the reproductive cycle.

8. To provide learners with opportunities to appreciate the special nutritional problems faced by the teenage mother.

9. To assist learners to understand the significance of proper nutrition for infants and children.

10. To provide learners with opportunities to explore and analyze recent research in nutrition and its application to people.

11. To assist learners to establish useable criteria for food selection.

12. To assist learners to understand food faddism and its implications to health.

13. To assist learners to take responsibility for their own nutrition and health.

14. To assist learners to understand that there are differences of opinion about foods and nutrients, especially in areas where scientific knowledge is incomplete.

15. To provide learners with opportunities to explore the various trends in food practices in the United States; fast food service, vegetarianism, and home gardening.

16. To provide learners with opportunities to investigate ecological problems in the United States including food waste, increased food processing, land management and agricultural needs.

PART FIVE:
ESSENTIAL NUTRITION INFORMATION FOR TEACHERS

*** EVOLUTION OF FOOD ***

*** EFFECTS OF THE NEED FOR FOOD ON SOCIETIES ***

*** EATING BEHAVIOR ***

*** FOOD FOR MAINTENANCE, ENERGY, AND GROWTH ***

*** HOW FOOD AFFECTS GROWTH AND DEVELOPMENT ***

*** EFFECTS OF NUTRITION ON HEALTH ***

*** ACHIEVING AND MAINTAINING BEST WEIGHT ***

*** ADEQUACY OF TEENAGER'S DIET ***

*** NUTRITION DURING PHASES OF THE REPRODUCTIVE CYCLE ***

*** FOOD ECOLOGY ***

*** NUTRITION PROBLEMS IN THE UNITED STATES ***

*** PROGRAMS TO IMPROVE NUTRITIONAL WELL-BEING ***

*** GLOBAL NUTRITION: ECOLOGICAL PERSPECTIVES ***

*** NUTRITION RESEARCH ***

EVOLUTION OF FOOD

What is Food?

Food is necessary extraneous solid and liquid substances which, once ingested, are transformed into nutrients that are used by the body to provide energy and to maintain life, growth (development and repair of body cells), and the normal functioning of organs. Nutrients are the useful chemical substances contained in food. They include carbohydrates, proteins (amino acids), fats, vitamins and minerals. Although water is generally not considered a nutrient, it is essential for nutrition and for all of life's processes. Nutrition is the process of assimilating food.

Nutrition is the interaction between people, their food and their environment. Nutrition is an integral part of the dynamic equilibrium that comprises good health. Students should appreciate the vital role of food in life, and should understand how food practices affect and are affected by other factors. For example, the malnourished individual is more susceptible to infection and is less able to recover quickly; the disease may aggravate the malnutrition causing a loss of appetite, or an impairment of absorption. Cultural traditions of avoiding certain foods, or withholding some types of food from the diet of a sick person may result in prolonging the illness or causing complications.

Prehistoric

Since food is absolutely necessary to stop hunger and for survival, people have always been concerned with its acquisition. Prehistoric people were food gatherers. They ate the fruits, vegetables, seeds, grains and nuts they could find growing wild, hunted for meat and fished. They were virtually dependent on obtaining a continuous supply of fresh food, and nearly all of their time was devoted to finding food. Prehistoric people lived in areas where food grew most of the year, or they acquired a hunting lifestyle that provided them with a continuous supply of fresh meat. They began to cultivate grains for food near the end of the Stone Age (approximately 7000 B.C.). Since food was not always available, primitive people were frequently hungry. Obesity was probably not a problem.

Beginning of Agriculture

Dry weather forced early people to move to the lakes, rivers, and the sea. They discovered that seeds dropped in the ground could yield a harvest several months later. At this point in history, people became food producers, and cultivated food that could be stored. The increase in the food supply could now sustain a substantial increase in the human population. Fruits and vegetables deteriorate rapidly, but seeds, including cereal grains, can be stored for long periods of time.

Thus, the main crop was grain. Probably wheat and barley were the first grains cultivated , and people could store a harvest in order to have food during a dry or cold season. It is unlikely, however, that cereal crops would have been of much use to people if they had not simultaneously developed cooking skills. As a result, agriculture and food processing developed as complementary technologies. At this time, people also added berries and honey to their basic diet.

At first, grain was just roasted and eaten. Then people began to make bread that was flat (unleavened). Grain and water were mixed and pounded to make a pasty dough and cooked over a fire. Later, people learned to make raised bread. The Egyptians are said to have made the discovery first by grinding the grain between stones, which not only crushed the grain, but reduced the endosperm (mainly starch) to a fine flour, leaving much of the bran in larger fragments. They separated the fine flour from the bran with sieves and used the fine flour for bread baking, letting the bread dough ferment before cooking it.

Importance of Grains

People almost everywhere in the world depend on grain for a large part of their food. In parts of the Middle East, bread is looked upon as sacred. It is considered improper to drop a crumb of bread. A meal is not considered complete unless bread is eaten. Rice has a similar status in many parts of the Far East.

Wheat is grown and eaten in the Middle East, Europe, North and South America and parts of Asia. The milling of wheat makes white flour. Rye is used mainly in Northern Europe; cassava (tapioca) in Africa, corn in Central and Southern United States. Besides bread, rice and other cereals provide grain for our diets, along with hominy grits, other cooked cereals, such as oatmeal; and pasta, such as spaghetti and macaroni.

Cereals are sometimes avoided in our culture because of the high-calorie image they have acquired. However, enriched and whole grain cereals and bread are important sources of iron, thiamin, niacin, and riboflavin. Cereal grains that provide most of the world's calories also provide most of its direct protein nourishment. North American diets generally include enough protein from other sources so that cereal protein is less important. Some grains are superior to others in protein content. For example, oatmeal is a better source of protein than whole wheat; whole rice, the staple grain of half the world, is also a better protein source than wheat, although not quite as rich as oats. Whole corn is not as valuable as a protein source as whole wheat. It should be emphasized that cereals contribute more than just calories to the diet. Besides vitamins, calories, and protein, whole grains also provide fiber to the diet. While manufacturing processes remove some of the nutrients in whole grains, many today are enriched with vitamins and minerals.

Expansion of Agriculture

During the Middle Ages, agricultural practices were usually poor by today's standards; insects and rodents took their toll, wars were frequent, and food was often scarce. Hunger was common and many people starved.

Today, in the United States the scientific advancements made in agriculture, animal husbandry, dairy and poultry farming have resulted in improvements in the quality and quantity of food produced. Invention of machines, such as the tractor, the combine, and the milker have increased the productivity of farmers. Knowledge of soils, fertilizers, and plant and animal genetics have also increased the amount of food a farmer can produce. Many plant and animal diseases have been brought under control. Pasteurization of milk has helped control bacterial infections, and pesticides have brought about control of many plant diseases, all

of which have increased the quantity, as well as the quality of foods that are available. Instead of producing only enough food for the family, the farmer can produce food for many other people. The farmer can thus sell the food produced and use the money to buy other goods and services. Surplus foods can be frozen or stored for use in the future.

EFFECTS OF THE NEED FOR FOOD ON SOCIETIES

Introduction

Food evolved, and as the division of labor regarding the acquisition and distribution of food became firmly established, the organization of countries and explorations conducted by them were affected. These shifts were reflected in differing historical and political phenomena. The historical situations described below are meant only as examples of the basic role that food played as a motivating factor and as a political tool in the unfolding of history.

The availability of food has influenced the course of wars, revolutions, and political alliances. For example, the lack of food was a factor in the frustrations that led to the French Revolution in 1789. Hungry people, faced with a scarcity of bread (their staple food) and rising prices, and distrustful of the King and Queen, believed that the royalty had the means to feed them but chose not to. The people marched on the royal palace at Versailles and captured the King and Queen --- but got no food.

The War Between the States demonstrated the effectiveness of interfering with the army's food supply in order to defeat it. The South depended on trade with England and France for grain. Long-continued blockading of Southern ports contributed to a food shortage in the South.

The interaction of political treaties and international alliances with nutrition is very well described in "De Ship Da Hab De Bush."* The Treaty of Paris agreed to by President George Washington contained a clause that restricted trade between the merchants of New England and the British West Indies. Since nearly all of the arable land of the Caribbean was planted to sugar, this restriction of trade proved to be disastrous, resulting in the most severe famine ever experienced in the Western Hemisphere.

King George III of Great Britain employed Captain William Bligh to sail to Polynesia to acquire breadfruit plants to be shipped to the West Indies. His first voyage ended in the famous mutiny. However, his second voyage resulted in his planting fruits and vegetables and gathering seeds and cuttings. Today, the apples and potatoes he planted in Tasmania in 1789 are a major source of the income of the island. His voyage was climaxed when he arrived in Kingston, Jamaica with the breadfruit for the slaves. Their gratitude was exemplified by their expression, "De ship da hab de bush."

World Explorations

The search for needed or desired food items motivated much of the exploration of the world. Spices have always been prized, not only for their flavor, but for their value as preservatives. Before the time of refrigeration, pepper, salt and other spices helped to preserve food and to improve the flavor of food that was partly spoiled. The European desire for spices was one of the bases for an active trade for centuries. Arabs bought the spices from India, Ceylon, and Burma and sold them to Europeans. It wasn't until Marco Polo's stories of seeing spices in the Indies that Europeans realized where these spices came from. The spice trade supported the monarchs of Spain and Portugal until the merchants of

---

*Enloe, C.F., "De Ship Da Hab De Bush," Nutrition Today, 10(1), 1975, p.7

Venice established a monopoly on the commerce in the Mediterranean and with the aid of the Ottoman Turks, seized the Middle East, the land bridge to the Orient. As a result, there arose great interest in finding a sea route to the Indies. This was the motivation for Vasco de Gama's voyage around the Cape of Good Hope and his successful return to Portugal in 1497 with a shipload of spices.

Columbus, who in 1492 was searching for a new trade route for Spain, thought he was going to the Indies when he landed in America. Instead of bringing precious spices back to Spain, he brought Indian maize (corn) which, until then, did not exist in Europe. As it turned out, the Portuguese got the spice trade, and Spain, by accident, got a foothold in the New World.

The problems of providing adequate food have limited people's ability to explore and conquer their environment. For centuries, it was common on long sea voyages for many sailors to become ill and to die from a disease of unknown origin. The disease was called scurvy. On Vasco de Gama's voyage around the Cape of Good Hope, 100 out of 160 men died. Scurvy remained a plague until 1753 when a British Navy surgeon, James Lind, showed that eating citrus fruit regularly would cure and prevent scurvy. It was the long months at sea with no fresh fruits and vegetables and hence a deficiency of vitamin C that produced the disease.

It was not until many years later that we learned that scurvy is caused by a deficiency of vitamin C --- a vitamin that is found in fruits and vegetables. After the discovery that eating citrus fruits would prevent scurvy, the British Navy took limes on long voyages. Thus, British sailors became known as "limeys."

A century after James Lind demonstrated that citrus fruit cured and prevented scurvy, an American physician, Dr. James Logan, revealed in a letter that it was not the hostile Indians, the storms, nor the grinding hardships of the journey across the plains, mountains and desert that were the implacable enemy of the early settlers, it was scurvy ... a preventable disease for which a cure was known. He also revealed that scurvy was the principal cause of illness and death among those who tried to strike it rich in the California gold rush. The saviors of the day were German immigrants who cured many miners with a diet rich in potatoes, a source of vitamin C. It is interesting to note that Lind's discovery went unrecognized in many parts of the world for 150 years.

Exploration still requires that we provide adequate food for the explorers. Feeding astronauts in space has been a difficult problem and has prompted new ideas in food preparation and packaging. In Skylab, for example, several food types were available to the crew in addition to dehydrated food. Frozen, thermostabilized, and intermediate moisture foods were used. Condiments consisting of liquid pepper, liquid garlic, and Tabasco Sauce were supplied along with dehydrated horseradish and salt. As a result of the Apollo space flights, fluid and electrolyte balance appeared to be the greatest nutritional problems facing space travelers. Therefore, the Apollo beverages were supplemented by the addition of potassium gluconate.

EATING BEHAVIOR

Food Habits

In discussing food habits, it is important to present them as ways in which people differ. No culture has all the "right" or "wrong" ideas on the subject. Food habits may affect nutritional health either positively or negatively. The main point is the idea that the nutrition problems of developing countries cannot be solved easily because we are dealing with varieties of peoples who have their own ideas of what is right and wrong, appropriate and inappropriate eating patterns.

Food habits refer to the whole complex of behavior associated with eating, which is an integral part of every culture and family. Children learn early that certain objects are "food" and others are "not food," and these ideas vary considerably from one culture to another. Beyond the distinction between "food" and "not food," we make very fine distinctions about how we like our food prepared and served, what foods we eat together and at what time of day, as well as what foods are appropriate for particular occasions.

It is because of the interrelationships among food habits and other aspects of the culture that care must be taken in introducing new foods or in attempting to change food habits. Some food habits are very deeply embedded in a culture. To change them would affect other areas of belief and/or behavior. Persons who want to help others learn to choose food wisely for good health must learn the food habits of the people with whom they are working, the reasons for the food habits, and the possible effects of changing them. It is usually better to tailor programs around existing food habits than to attempt to persuade people to change them radically.

Food habits do change, due to many factors:

- moving from rural to urban areas may necessitate a change in food habits.
- introduction of a cash crop will replace other crops and affect food habits.
- food products introduced by commercial companies can change food habits.
- foods associated with social prestige become popular and are responsible for dietary changes.
- affluence makes more money available to purchase and demand new types of foods.
- changing trends in family organization and responsibilities.

In order to accept a new food, people must have confidence that it is safe, tasty, and wholesome, and it must be presented in an appealing way. In the United States, variety is a positive value. Most of us want variety in our meals. In many cultures, monotony is prized; i.e., the same food at every meal provides stability and security. New foods in these kinds of societies will not hold the attraction that they do in the United States.

Food Preferences

Children up to about the age of nine years may have little choice as to what they eat (except that they can choose to eat or not to eat what is provided for them), but they do have definite individual food preferences that are the result of a number of factors. These include:

- o the likes and dislikes of their peers.
- o the kinds of food their parents purchase.
- o the kinds of food their parents are able to prepare for them. Economic, cultural, and religious factors become important determinants of the foods a family can provide.
- o the availability of specific foods in the geographic region during the various seasons of the year.
- o the kinds of food advertised on radio, television, and in newspapers and magazines.
- o the prejudices about foods that were developed earlier in life.
- o having experiences in helping to produce and/or prepare their own food.
- o buying food alone or with the family at the supermarket or restaurant.
- o factors related to physical development and conditions, such as mixed dentition, missing or decayed teeth.

Many children may not have been exposed to a wide variety of foods and their preferences are a consequence of their cultural and environmental situations with little regard for their nutritional needs. Therefore, while it is important to lay the groundwork for informed choices of foods, this can best be accomplished by establishing positive attitudes toward foods and the willingness to try a variety of foods.

Foods and the Senses

We all have favorite foods that give us pleasure because we like the way they taste, feel, smell and look. Everybody has his or her own idea of which foods taste good. Taste is determined by the taste buds and the sense of smell. Taste buds on the tongue are located in the following places:

- o *sweet;* tip of the tongue and on the sides halfway back.
- o *salt;* tip of the tongue and around the edges.
- o *bitter;* back of the tongue.
- o *sour;* sides of the tongue.

Taste can be pleasurable or not pleasurable as a result of earlier eating experiences. We learn to like or to dislike certain tastes. Also, some foods may not look appetizing to some people, but once they taste them they may discover that they like them. Taste and palatability of foods should not be ignored in nutrition education and probably should receive more attention, especially as teachers and cafeteria personnel work more together.

Psychological Influence

People use food for purposes other than nourishment; some of these purposes are the expression of hospitality, love, concern and comfort. Foods are associated with events, people, places and pleasant and unpleasant feelings. For example, many people offer food and drink (cake and coffee, cookies and tea, or milk and cookies) to visitors to their homes as a welcoming gesture. When there is an illness in the family, for instance, food is often brought to the family by friends who are concerned for their welfare and want to offer some help. Food is also used in dealing with one's tension, conflict, guilt or loneliness. The important point is to recognize that food serves an unusually wide array of purposes in our lives.

Emotional responses to food come from many sources. The environment surrounding one's early infant feeding, as well as cultural and family conditioning, religious and economic factors, mold the adult's behavior with respect to food. Some foods have symbolic meanings. For example, some foods may symbolize security and comfort, some have masculine meanings, while others may convey feminine meanings. Foods, especially sweets, are also used as rewards for good behavior, and are withheld for unacceptable behavior. This pattern of reward and punishment, for example, may persist into adulthood.

Cultural Influences

Food habits are among the oldest and most entrenched aspects of many cultures. The cultural background determines what shall be eaten, as well as when and how it should be eaten. For example, in the United States, milk is considered an excellent basic food, while in some other countries it is not.

Family and individual eating patterns are the results of a complex of personal and sociocultural factors. People select foods that are available to them, that taste good to them, and that they can afford. They also select foods that fit into their customs and lifestyle. An increasing number of families seldom gather for formal meals. Thus, the stability that was formerly felt from eating together is becoming lost. Children who are left to feed themselves often develop erratic and nutritionally inadequate eating habits. Peer influence and meals offered outside the home (the school lunch program) affect children's food behavior. In addition, our food habits change as we grow older and are influenced by factors outside of the family.

Today, Americans in general are consuming increased amounts of processed foods which are prepared at home or purchased and eaten at all kinds of restaurants, particularly fast food restaurants. Many of these foods do not contain all of the nutrients which were characteristic of foods grown in home gardens or purchased in markets a generation ago. There is a trend, however, toward more families growing some of their own food,which may signal a return of more fresh vegetables being eaten during the growing season.

Body Image and Food

Everyone has a self-image, an inner picture of how he or she looks to others. Much of this self-image is related to dietary habits. Children are especially sensitive about their bodies and how theirs' compares with other children. They

may view themselves as being fat when they are not and, as a result, they may try to eat less to lose weight. If some children view themselves as smaller and not as well-developed as other children the same age, they may try to eat more than is needed. In both cases, good dietary habits are being sacrificed because of the need that some children have to conform to what they perceive as the most accepted body image. The development of a positive self-concept is an important factor in nutritional behavior as with many other aspects of the individual's life. While body image is not synonymous with self-image they are often closely intertwined. Havighurst* suggests that a key developmental task in adolescence years is to be proud, or at least tolerant of one's body to use and protect one's body effectively and with personal satisfaction.

Economic Factors

People tend to eat foods that are readily available to them and that they can afford. Thus, family income as well as the rising cost of most foods influence food habits and ultimate food choices. However, economic status is not necessarily the most important factor affecting nutritional health. It is often possible for families to choose nutritious foods that are within their limited budget. Many affluent American families, on the other hand, may select foods that are not nutritious even though economics is not a factor. One of the chief factors influencing the quality of the diets of a family is the quality of its nutrition knowledge, and its ability and motivation to buy nutritious foods.

Fast Foods Service

In recent years, more and more people have found the fast food restaurants convenient for lunches and snacks. Although there has been concern about the quality of nutrition from many of these restaurants, recent studies indicate that some of these meals provide 40-80 percent of the protein required daily by the average adult. However, nutrients, such as vitamin A, biotin, copper, folacin and iron may be lacking or present in insignificant amounts. If soft drinks or coffee are the preferred beverage, meals may also be deficient in calcium. Overall, fast food meals tend to be high in calories, suggesting that attention must be given to other meals and snacks eaten during the day.

Advertising

An important activity in marketing food is advertising. Advertisements for food products make up a large part of the advertising time and space on television, radio, and in magazines and newspapers. A great percentage of these advertisements are for "junk foods" which more correctly should be typified as foods low in nutrient density, and vitamin and mineral supplements and are often geared toward children and adolescents. Learners should be taught how to evaluate advertising messages.

Nutritional Quackery

The propaganda of the food faddist and the nutritional quack persuades many people to spend money on worthless food supplements and fad diets. One's health could be jeopardized if some of the highly restricted diets are followed completely.

*Havighurst identified developmental tasks that each person must achieve during various phases of development. Developmental tasks are described as accomplishments necessary for development at a particular age level before one can proceed to the next stage of development.

The quack, according to dictionary definitions, is the one who boasts to have a knowledge of wonderful remedies; an imposter in medicine. Nutritional quackery is the most widespread and expensive kind of health quackery in the United States today. Many millions of dollars are spent for worthless products. These products account for many tragic consequences and, in some cases, even deaths.

There are varying degrees of food faddism and quackery. At one end of the spectrum are the relatively innocuous beliefs held by some people that specific foods will give them a "tonic" or be good for their various ailments. Many people waste money on health foods or vitamin preparations.At the other extreme are the "treatments," "cures," and phony dietary regimens that can lead a person to severe malnutrition and sometimes death. Belief in faddist "cures" can result in the postponement of legitimate medical treatment of a serious disease until the disease has progressed too far to be treated.

Vitamin E has been recommended by faddists as a cure for an array of unrelated conditions from high blood pressure to atherosclerosis, coronary thrombosis and varicose veins. There is no scientific evidence for any of these claims.

The Zen Macrobiotic Diets are examples of extreme dietary habits which lead to malnutrition. Cases of scurvy, anemia, hypoproteinemia, hypocalcemia, emaciation due to starvation, in addition to loss of kidney function resulting from restricted fluid intake, have been reported in persons who follow the Zen diets. Some of these cases have resulted in death.

People who are ill (and especially the elderly ill) are vulnerable to the claims of the faddist or the quack because they offer an "easy" solution to what may be a very serious and upsetting problem. These ill people may avoid or postpone much needed medical attention while relying on the worthless treatment of the faddist's regimen. People who are not sick are also vulnerable. Many health foods, tonics, and supplements, offer the hope of a "lift," a release from fatigue, a renewed youthfulness and vitality. These claims are very attractive to many people. But "health foods" contain nothing that is not available from ordinary foods at less cost. A person who eats a balanced diet does not usually need supplements.

The whole area of weight reduction is fraught with faddism and quackery. Diets that claim to "take off pounds without hunger" or candies, special foods or pills to help reduce are usually useless and may be dangeorus. Reducing should always be done under medical supervision, as there is no magic or easy way to do it.

The typical approach of the quack may include the following kinds of claims:

- o A special or "secret" food, formula, diet, or device that can cure a variety of diseases.
- o A quick, easy cure or "lift."
- o Case histories attesting to the value of the product: Testimonials.
- o Claiming a method better than a physician's, perhaps because it is new, unknown, or secret.
- o Claiming that overprocessing and depleted soil are robbing foods of their nutritional value--"natural" foods or "organic" foods must be eaten.

Nutritional quackery cheats people. At its worst, it can be very dangerous. Several agencies and organizations attempt to curtail the activities of nutritional quacks. These include the American Medical Association, the National Better Business Bureau, the Food and Drug Administration, Federal Trade Commission, and Consumer Protection Agencies, as well as State and local Health Departments.

Under the protection of the First Amendment to the Constitution, a person may write anything he/she chooses and sell it in a book. Thus, there is no legal grounds for action against many writers of faddist nutrition books. If, however, the publication is sold with and used to promote a product that is fraudulent, it can be seized. For example, a once best-selling book *Calories Don't Count* was seized and the author prosecuted only when the book was sold with a product---in this case, safflower oil capsules, useless for the purpose for which they were promoted.

Some Food Myths

People in all parts of the world have beliefs or superstitions about foods. Food fads appeal especially to certain groups of people who have particular needs and concerns. Among these are the middle-aged, the elderly, adolescents, and the obese. Some claims by food faddists are:

- Certain foods will cure specific conditions.
- If you have an ache or pain or are just feeling tired, you are probably suffering from a vitamin or mineral deficiency.
- Special food combinations are very effective as reducing diets and have special therapeutic effects.
- Vitamin supplements are necessary.
- Only "natural foods" can meet body needs and prevent disease.
- Onion and garlic will cure a cold or purify the blood.
- Certain combinations of food are dangerous.
- Citrus fruits make the blood acid.
- Toasting bread lowers its caloric content.
- Potatoes are fattening; cottage cheese is not.
- Vegetarian diets are more healthful than those that include meat.
- There are no calories in salads.
- Excess amounts of various nutrients will result in better total health.

These claims are not substantiated by scientific evidence. There have been and will continue to be more food fads, misinformation, and quackery for us to sift through. Sound nutrition and health education will enable the student to make intelligent dietary choices throughout life.

FOOD FOR MAINTENANCE, ENERGY, AND GROWTH

Food Is the Source of Specific Nutrients

Wherever people have managed to survive, they have found food that would supply at least the minimum nutrients necessary for survival. All people must have enough food for energy, and enough of the foods that supply protein, vitamins and minerals. Many people in the world do not have all the foods they need for health. However, there are many different combinations of foods that do supply the nutrients people need. As valuable as each nutrient is, each one can pose potential hazards to health when used exclusively or excessively. Any major deviation in dietary patterns should be undertaken only under medical supervision.

With the possible exception of iodine, iron and fluorine, a balanced diet provides the nutrients one needs to maintain good health under normal conditions. The practice of adjusting the diet by supplementing nutrients in pill, capsule, or liquid forms can be a waste of money and dangerous to health. Certain nutrients (water soluble vitamins B and C) are eliminated from the body if consumed in larger amounts than the body needs daily. Other nutrients taken in excessive amounts may interfere with normal metabolism (protein) or produce toxic conditions by accumulating in body tissues (fat soluble vitamin A). There may be nutrients yet undiscovered that we get from food, but which are not in synthetic preparations.

Vitamins

Vitamin sources are varied and abundant. Severe vitamin deficiencies are so rare in the United States that medical students have difficulty finding cases for study. Slight vitamin deficiencies do exist and affect the energy level, irritability, healing process, gum health, skin, hair and nails of those who do not eat the various vitamins in sufficient amounts. Persons whose diets do not contain enough vitamins or who need therapeutic doses of vitamins due to illness should consult a physician for proper advice about supplements. Self-diagnosis and self-treatment of presumed vitamin deficiencies can themselves lead to illness.

As with any drug, multivitamin pills are dangerous if consumed in large quantities. They should always be kept out of the reach of children (never left on the kitchen or dining room table.) The FDA's National Clearinghouse for Poison Control Centers records over 4,000 vitamin poisonings in the United States per year, with about 3,200 cases involving children.

Minerals

Minerals are inorganic, crystalline, homogeneous chemicals. They perform very important functions in the body including control of water balance, regulation of acid-base balance, acting as catalysts for body reactions, becoming components of structures, enzymes, and hormones. The minerals that are in relatively large amounts in the body are called macronutrient minerals while those present in trace amounts are called micronutrient minerals. The macronutrient minerals are calcium, chlorine, magnesium, phosphorus, potassium, sodium and sulfur, while chromium, cobalt, copper, fluorine, iodine, iron, manganese, molybdenum, selenium and zinc are micronutrient minerals.

WATER SOLUBLE VITAMINS

Vitamin	Sources
Thiamin	breads and cereals, pork, veal, beef, lamb, chicken breast, calf liver, egg, nuts, beans, green vegetables, potatoes, milk
Riboflavin	Dairy products, beef, veal, pork, lamb, chicken breast, calf liver, fish, egg, nuts, beans, breads and cereals, green and yellow vegetables
Niacin	Beef, veal, pork, lamb, chicken breast, turkey, calf liver, fish, egg, beans, nuts, breads and cereals, green vegetables, potato
B_6	meats, banana, grains, lima beans, cabbage, potato, spinach, milk
Pantothenic Acid	organ meats, grains, (most foods contain this vitamin including fruits and vegetables).
Biotin	synthesized in the human intestines. egg yolk, milk, organ meats, cereals, legumes and nuts
Folacin	dark green leafy vegetables, liver, kidney
B_{12}	foods from animal sources, meat, egg, dairy products
Ascorbic acid	citrus fruits, strawberries, broccoli, cabbage, tomato, potato

FAT SOLUBLE VITAMINS

Vitamin	Sources
A	liver, egg yolk, dairy products, sweet potato, winter squash, greens, carrots, cantaloupe
D	fortified milk, egg, cheese, butter, fish
E	vegetable oils, greens
K	greens, liver, egg yolk

RECOMMENDED DAILY DIETARY ALLOWANCES (RDA)

Fat-Soluble Vitamins

	AGE (Years)	A (RE)[a]	A (IU)	D (IU)	E (IU)
Infants	0-.5	420	1400	400	4
	.5-1	400	2000	400	5
Children	1-3	400	2000	400	7
	4-6	500	2500	400	9
	7-10	700	3300	400	10
Males	11-14	1000	5000	400	12
	15-18	1000	5000	400	15
	19-22	1000	5000	400	15
	23-50	1000	5000		15
	51+	1000	5000		15
Females	11-14	800	4000	400	12
	15-18	800	4000	400	12
	19-22	800	4000	400	12
	23-50	800	4000		12
	51+	800	4000		12
Pregnant		1000	5000	400	15
Lactating		1200	6000	400	15

a Retinol equivalents

Source of data: Food and Nutrition Board, National Academy of Sciences --- National Research Council, 1974

RECOMMENDED DAILY DIETARY ALLOWANCES (RDA)

Water-Soluble Vitamins

	Age (Years)	Ascorbic Acid (mg)	Folacin (mg)	Niacin (mg)	Ribo-flavin (mg)	Thiamin (mg)	B_6	B_{12}
Infants	0-.5	35	50	5	.4	.3	.3	.3
	.5-1	35	50	8	.6	.5	.4	.3
Children	1-3	40	100	9	.8	.7	.6	1
	4-6	40	200	12	1.1	.9	.9	1.5
	7-10	40	300	16	1.2	1.2	1.2	2
Males	11-14	45	400	18	1.5	1.4	1.6	3
	15-18	45	400	20	1.8	1.5	2	3
	19-22	45	400	20	1.8	1.5	2	3
	23-50	45	400	18	1.6	1.4	2	3
	51+	45	400	16	1.5	1.2	2	3
Females	11-14	45	400	16	1.3	1.2	1.6	3
	15-18	45	400	14	1.4	1.1	2	3
	19-22	45	400	14	1.4	1.1	2	3
	23-50	45	400	13	1.2	1.0	2	3
	50+	45	400	12	1.1	1.0	2	3
Pregnant		60	800	+2	+.3	+.3	2.5	4
Lactating		80	600	+4	+.5	+.3	2.5	4

Source of data: Food and Nutrition Board, National Academy of Sciences --- National Research Council, 1974

SUMMARY OF INFORMATION ON MINERALS

Mineral	Food Sources	Use in the Body
Calcium	Milk, dairy products, cheese, some dark green, leafy vegetables	Normal development and maintenance of bones and teeth, clotting of blood, nerve irritability, normal heart action, normal muscle activity
Phosphorus	Milk and cheese, egg yolk, meat poultry, fish, whole grain cereals, legumes, nuts	Normal development and maintenance of bones and teeth, cell activity, maintenance of normal acid-base balance of the blood, normal muscle activity, metabolism of carbohydrates and fats
Sodium	Salt, meat, poultry, fish, eggs, milk	Maintenance of body neutrality and water balance, osmosis, regulates muscle and nerve irritability
Potassium	Meat, poultry, fish, cereals, fruits, vegetables	Osmosis, maintenance of body neutrality and water balance, regular heart rhythm, regulation of nerve and muscle irritability
Chlorine	Same as sodium	Osmosis, maintenance of body neutrality and water balance
Magnesium	Dry beans, nuts, peanut butter, wheat germ and bran. Seeds: sunflower, pumpkin, sesame, oatmeal, corn and cornmeal; fresh green vegetables	Constituent of bones, necessary for healthy muscles, nerves, and organs, metabolism
Sulfur	Protein foods	For growth and health of hair, bones, and soft tissues
TRACE MINERALS		
Iodine	Saltwater fish, foods grown in soil bordering salt water, iodized salt	Formation of hormones in thyroid gland
Iron	Liver and other organ meats, muscle meats, legumes, dried fruits, egg yolk, whole grain or enriched breads and cereals, dark green and leafy vegetables	Essential for formation of hemoglobin
Copper	Liver, muscle meats, nuts, legumes	Essential for formation of hemoglobin

Mineral	Food Sources	Use in the Body
TRACE MINERALS (CONTINUED)		
Manganese	Blueberries, wheat germ, nuts	Essential for blood formation Endocrine glands
Zinc	Seafood, oysters, liver, wheat germ, yeast	Component of insulin and an enzyme
Cobalt	Supplied in vitamin B_{12}	A component of vitamin B_{12} necessary for formation of the red blood cells
Fluorine	Fluoridated water	Increases resistance to tooth decay

Other trace minerals are aluminum, boron, molybdenum, selenium, cadmium and chromium.

RECOMMENDED DAILY DIETARY ALLOWANCES (RDA)

Minerals

	Age (Years)	Calcium (mg)	Phosphorus (mg)	Iodine (mg)	Iron (mg)	Magnesium (mg)	Zinc (mg)
Infants	0-.5	360	240	35	10	60	3
	.5-1	540	400	45	15	70	5
Children	1-3	800	800	60	15	150	10
	4-6	800	800	80	10	200	10
	7-10	800	800	110	10	250	10
Males	11-14	1200	1200	130	18	350	15
	15-18	1200	1200	150	18	400	15
	19-22	800	800	140	10	350	15
	23-50	800	800	130	10	350	15
	51+	800	800	110	10	350	15
Females	11-14	1200	1200	115	18	300	15
	15-18	1200	1200	115	18	300	15
	19-22	800	800	100	18	300	15
	23-50	800	800	100	18	300	15
	51+	800	800	80	10	300	15
Pregnant		1200	1200	125	18+	450	20
Lactating		1200	1200	150	18	450	20

Source of data: Food and Nutrition Board, National Academy of Sciences --- National Research Council, 1974

Protein Quality

Proteins are made up of molecules called amino acids, of which eight are essential (i.e., must be included in the diet) to human health since these eight cannot be synthesized by the body. (There are 9 amino acids that must be provided for children.) A complete protein food contains all the essential amino acids in approximately the correct ratios to be utilized by the body and to support growth. Animal proteins found in milk, eggs, meat, fish, and poultry are complete. The eight essential amino acids are methionine, threonine, tryptophan, isoleucine, leucine, lysine, valine, phenylalanine. In addition, children need a ninth amino acid, histidine.

Incomplete proteins lack one or more essential amino acids, and are characteristic of plant proteins. Some examples of sources of incomplete proteins are grains, legumes (dried peas and beans), rice, and nuts. An incomplete protein by itself will not support growth, since a lack of one of the eight essential amino acids will result in an inability to use the rest of the amino acids. In most developing countries, most of the protein comes from grains, a source of incomplete protein.

The protein value of the diet depends on both the quantity and quality of the protein. A complete protein has an amino acid pattern which approximates the requirements of humans for the essential amino acids. Although plant proteins tend to be deficient in one or more amino acids, they may be rich in others. The solution is to combine plant proteins so that they complement each other and overcome amino acid deficiencies. For example, the consumption of beans and rice together, typical of the Puerto Rican dietary pattern, provides a high quality protein meal. Rice protein has a fairly adequate amino acid pattern. Although low in lysine, it is one of the best of all vegetable proteins, but the amount of protein in rice is relatively small. It would take a large amount of rice to supply one's protein needs. Beans, however, contain about three times as much protein as rice, but the protein quality of beans is lower than that of rice, as the amino acids methionine and cystine are insufficient. Eating the two foods together, however, supplies a combination of amino acids that is better than for either food separately. Rice supplies the methionine and cystine lacking in the bean protein, and the beans have a liberal supply of lysine, which is in lowest supply in rice.

The same kind of complementary effect occurs when one pours milk over cereal or eats cheese with bread. The incomplete pattern of essential amino acids in the cereal protein is complemented by the amino acids in the milk products, producing more food value than if the cereal had been eaten at another time than the milk, or the bread separately from the cheese.

Energy

After they are absorbed by the body, some nutrients present in foods are transformed into energy. These food sources are converted to the basic energy unit of glucose, which, in turn, is oxidized to release energy, water, and carbon dioxide. In humans, as in any energy system, energy is always present as either free energy or potential energy. Free energy is used at any given moment in the performance of a task. Potential energy is stored in various chemical compounds and is available for conversion to free energy when needed. When free energy is used up, potential energy is also being diminished. Thus, our bodies must be constantly refueled from some outside source. In the human energy system, this source is food.

Some very important considerations with respect to maintenance of energy for children and youth are listed below:

- Many children are accustomed to three regular meals a day at home. Some families, however, due to divergent schedules or lack of facilities for eating together, and for other reasons, may not sit down often to a meal as a family. This does not necessarily result in poor nutrition, but it may, especially if nutritious foods are not easily available to children who must serve themselves.

- Emphasis on meals may not be at all relevant for some children. Emphasis on eating nutritious foods at meals, for snacks, and all through the day will be a more effective approach for *all* children. Personal taste is a valid reason for eating food, but children should be helped to realize that more than taste should be involved in choosing foods to eat. It is important to avoid instilling the attitude that there are two kinds of foods: "Those that I like," and, "Those which are good for me."

- We should be aware that a lunch does not need to be hot to be adequate, and that variety is not essential for an adequate diet. However, nutritional adequacy is more likely when a variety of foods is eaten. Willingness to try new foods will be an attitude that will pay off in social situations and in adaptability to new environments, as well as helping to insure nutritional adequacy.

- Fast food restaurants may or may not serve foods that meet the daily nutritional needs of a young person. This depends upon the person's choice of the foods that make up the meal.

- Ready to serve, processed foods, may not contain the nutrients associated with the fresh grown foods which traditionally have contributed to meeting the recommended daily dietary requirements. Manufacturing procedures may alter the original composition of food.

- The influence of athletics on food intake should be analyzed by coaches, students and teachers, and unhealthful food intake to gain or lose weight or to become more muscular must be understood as poor health practices.

RECOMMENDED DAILY DIETARY ALLOWANCES (RDA)

Energy and Protein

	Age (Years)	Weight (Kg)	Weight (lbs)	Height (cm)	Height (in)	Energy (k cal)	Protein (g)
Infants	0-.5	6	14	60	24	kgx117	kgx2.2
	.5-1	9	20	71	28	kgx108	kgx2.0
Children	1-3	13	28	86	34	1300	23
	4-6	20	44	110	44	1800	30
	7-10	30	66	135	54	2400	36
Males	11-14	44	97	158	63	2800	44
	15-18	61	134	172	69	3000	54
	19-22	67	147	172	69	3000	54
	23-50	70	154	172	69	2700	56
	51+	70	154	172	69	2400	56
Females	11-14	44	97	155	62	2400	44
	15-18	54	119	162	65	2100	48
	19-22	58	128	162	65	2100	46
	23-50	58	128	162	65	2000	46
	51+	58	128	162	65	1800	46
Pregnant						+300	+30
Lactating						+500	+20

Source of data: Food and Nutrition Board, National Academy of Sciences --- National Research Council, 1974

Breakfast

In order to maintain energy stores, it is necessary to eat adequate amounts of food periodically. Since the time from the last meal of the day to breakfast is usually long, it is important to "refuel" at this time. Breakfast is defined as food eaten early in the day's activities.

The phrase "food in the morning,"implies that traditional breakfast patterns and time of eating need not limit the choice of foods eaten. Many children do not eat traditional breakfasts of bacon and eggs or cereal and milk. It is not important that they do so. It is important, however, that the child have something to eat in the morning. In our culture, the term "breakfast" implies a rather rigid food pattern to many people. Some children, if asked what they ate for breakfast, may reply, "nothing," when, in fact, they did eat something that morning. If that something was a leftover piece of meat or rice from last night's dinner, the child may not think of it as breakfast. If we are to develop maximum awareness of the needs of children in this regard, it is important that we be sensitive to such labels. The morning meal (or "food in the morning") should contribute a substantial part of the calories and protein needed for the day. Such foods have an immediate effect on the blood glucose level and help to sustain a sense of well-being. High carbohydrate meals tend to give a short-term improvement only.

Digestion and Absorption

The body cannot make use of foods until they have been digested. Digestion is the process of converting the raw materials in foods into simple, absorbable nutrients which the body can use. During the digestive process, foods are changed from complex to simple substances by mechanical and chemical actions of the digestive organs. Mechanical action proceeds and the food continues to be broken down by the churning, muscular movements (peristalsis) of the gastrointestinal organs.

Chemical digestion also begins in the mouth where enzymes in the saliva begin to change carbohydrate foods into simpler sugars and starches. The catalytic action of several enzymes (pepsin, trypsin, erepsin, lipase, ptyalin, amylopsin, and invertase) and digestive juices of the stomach and small intestines convert proteins into absorbable amino acids, carbohydrates into glucose, and fats into fatty acids and glycerol.

Food remains in the stomach and small intestines for several hours. In addition to their chemical action on foods, the digestive juices destroy disease organisms and putrifying bacteria.

Absorption is the process by which nutrients pass through the villa of the digestive tract into body fluids and tissues. No nutrients are absorbed in the mouth. Although water, alcohol and small amounts of glucose are absorbed in the stomach, most absorption occurs in the small intestines where the simpler food substances pass through the intestinal walls into the blood and lymph. Through these fluid tissues the nutrients are carried to the liver and finally into the general circulation.

An alkaline fluid completes the chemical processing of indigestible foods in the large intestines. The large intestines absorb large amounts of water, helping to conserve body fluids. Gradually the contents of the large intestines are dehydrated and the remaining substances are eliminated as solid waste.

Enzymes are proteinaceous substances that are capable of bringing about reactions on food. There are enzymes that are specific to carbohydrates, fats, and proteins. Thus, starch is broken down to dextrins and disaccharides by the enzyme ptyalin in the mouth and by amylase in the small intestine which continues the breakdown of starch to disaccharides. The disaccharides are further degraded in the small intestine to the monosaccharides; glucose, fructose, and galactose. Fat is broken down by the enzyme lipase which is found in the stomach and small intestine. The fat molecules are split into monoglycerides, diglycerides, free fatty acids, and glycerol. Protein is broken down by protease enzymes in the stomach and small intestine which cleave the protein molecules into amino acids.

Most of the nutrients from digested food enter the bloodstream from the small intestine. The larger products of fat are carried through the lymphatic system and then enter the blood stream in the neck region through the thoracic duct. Undigestible material continues to the large intestine where it is prepared for evacuation. Another important function of the large intestine is to reabsorb water and electrolytes. An electrolyte is a chemical compound which, in solution, dissociates by releasing atomic particles that carry a positive or negative electrical charge. These particles are called ions.

HOW FOOD AFFECTS GROWTH AND DEVELOPMENT

Introduction

It is important that we obtain all of the nutrients that are essential for optimal growth. No single food contains all of the nutrients in sufficient quantities to maintain life and promote optimum growth. Carbohydrates, fats, and proteins are three classes of organic compounds that occur abundantly in various foods. It is important that people consume each of these nutrients daily to maintain optimum health. In addition to these, foods contain vitamins, which are organic compounds, and minerals, which are inorganic. Vitamins and minerals are needed for growth and health, but in much smaller quantities than carbohydrate, fat, and protein. Water is also necessary for optimum health.

Cells and Their Need for Nutrients

Most living things are made up of cells. Each cell has several parts and each part has a function. The plasma membrane regulates the flow of nutrients into the cells and the flow of wastes out of the cell. Other parts of the cell are the cytoplasm and nucleoplasm, which together constitute the protoplasm which is defined as the substance of life. Protoplasm is composed chiefly of proteins, carbohydrates, lipids, and a variety of inorganic salts. The plasma membrane is part of and surrounds the protoplasm.

The nucleus of the cell contains the genetic material, deoxyribonucleic acid (DNA). Ribonucleic acid (RNA) is formed from the DNA. RNA transfers information from the DNA to the protein-forming system of the cell. The cell's proteins are synthesized by the ribosomes which are located in the cytoplasm.

Digested and absorbed food provides the cell with nutrients necessary for the life of the cell. Without nutrients the cell cannot perform its functions and it dies.

There are many different kinds of cells. Animal and plant cells are different from one another. One difference is the cell wall. Only plant cells have a cell wall. Cells in different parts of the body are different. They look different, and they perform different jobs. Each cell in the body needs nutrients from foods for cell synthesis and maintenance. All cells need carbohydrates which are their primary source of heat and energy. All cells need vitamin C for the formation of the intercellular cement in many tissues. Different kinds of cells require particular nutrients. Bones and teeth need calcium, phosphorus, and vitamin D. Cells of bones and teeth also require fluoride for their strength. Fluoride appears naturally in some foods and water; however, some communities have adjusted the fluoride content of their water supplies to the recommended level of one part of fluoride to one million parts of water.

Red blood cells synthesize and transport hemoglobin, a red protein substance which consists of an iron-containing pigment which combines with oxygen. This is the means by which cells receive oxygen. Blood cells need iron in order to synthesize hemoglobin. Other nutrients that are required in maintaining hemoglobin synthesis are protein, vitamin B_{12}, folic acid (a B vitamin), vitamin B_6, and ascorbic acid (vitamin C).

The cells of the thyroid gland (a gland in the neck) need iodine. Iodine is an integral part of the thyroid gland hormones, thyroxine and triiodothyronine. Goiter (enlarged thyroid) is found in some parts of the United States. It could be significantly reduced if every family used adequate amounts of iodized salt.

Water is the principal chemical constituent of the body and is necessary for all metabolism. Water is obtained through a variety of foods, such as milk, fruit juice, and other beverages, as well as most solid foods.

Changing Nutrients Into Energy and Building Materials

The cells transform the elements in food into energy. During digestion food is converted to the basic energy source of glucose, which in turn is oxidized to release energy, water and carbon dioxide. The energy is used to keep our bodies warm; hearts beating, lungs breathing, and other vital functions going; to give us energy to move, play and do the work involved in building more cells.

Protein, fat, carbohydrate, vitamins, and minerals provide nutrients that are used by the cells to build materials necessary for making more cells. The body is constantly making cells needed for growth, and to repair and replace damaged or worn out cells.

The Role of Food

Each individual has his or her own pattern of growth which is determined by heredity, and influenced by nutrition. Food supplies the building materials, but heredity provides the blueprint for the building. Individual differences in amount and timing of growth are normal. Some people are taller or shorter, heavier or lighter than others. Boys and girls have different growth patterns.

Note:

If you decide to find the "average" height and weight of the class, be sensitive to the fact that learners may confuse the words, "average" and "normal." It is important that pupils realize that they can be normal and healthy and still be far from average. In case of a class that contains learners known to be sensitive to overweight or underweight, use data from another class or hypothetical data.

However, most people follow the same general pattern of growth and development, but there is a wide range of individual variations within the normal growth pattern. Growth in height and weight occurs in a predictable sequence. The most rapid growth occurs during prenatal life. This is a period of intensive cell division, and nutrient requirements are high. The rate of growth gradually slows down prior to birth, although the infant is still growing very rapidly. After birth, babies usually double their weight in 6 months and triple their birth weight by the end of the first year.

From ages 2-6 years, the rate of growth slows markedly and a child grows more or less steadily until adolescence. During this phase of growth, cell size and number is increasing. Just prior to adolescence, many children experience a "chubby" stage as an increase in weight is temporarily greater than an increase in height. During adolescence, about two years of very rapid growth occurs, after which growth in height and weight slows down and eventually ceases. In the adult, growth has stopped and the energy and nutrients from food are used mainly for maintenance and repair, and regulation of body processes.

Height and weight data for children should be compared against their own previous height and weight to show growth progress, rather than against the heights and weights of other children in the class or against a standardized population of children of a similar age. Standardized height and weight tables provide only an index of the average, not the individual. If some children are small or large in relation to classmates but are healthy, it is important to help them to realize that their size falls in a normal range. Acceptance of normal differences can help avoid more acute feelings of self-consciousness when the pupils are older. It may help to think of things that are an advantage for each type of person. For example, the tall child can reach high places; the short one can wriggle into small places; plump children may find it easier to learn to swim; thin children may be more agile, and so on. This area of nutrition education should be closely correlated with the school health personnel and the pupil personnel services staff. Valuable assistance can be obtained for students who have nutrition and growth problems, as well as other health problems including diabetes and obesity.

There are four phases of growth following birth:

- o a period of very rapid growth during infancy
- o a period of slower but fairly uniform growth throughout early and middle childhood
- o a period of rapid growth during adolescence
- o a period of gradual decline of growth until its cessation at adulthood.

Adequate nutrition, proper rest and exercise, and freedom from disease play important roles in determining whether an individual achieves full growth potential. A harmful environment resulting in malnutrition and/or frequent or prolonged disease disrupts normal growth patterns. A variety of foods is essential for optimal growth because some nutrients require the presence of other nutrients to be effective.

Some examples of the many interactions among nutrients are:

1. The protein in cereal is incomplete. Protein is made up of molecules called amino acids. If all the essential amino acids are present in the right amounts (as is the case in animal proteins) the protein is effectively utilized. If one or more of the amino acids is low or missing, the protein is less valuable--it is not complete protein. However, milk protein has plenty of the amino acids that are low in cereal protein. Milk is a complete protein. Thus, when cereal is eaten with milk, the cereal protein is able to be better utilized for growth.

2. Iron in food is better used by our bodies in the presence of vitamin C because this vitamin aids in the absorption of iron.

3. The need for thiamin increases as total calories, and especially carbohydrates, increases.

4. Some of the amino acid tryptophan is converted in the body to the vitamin niacin. Therefore, the requirement for niacin is less if a larger amount of protein is consumed.

Growth During Adolescence

The adolescent growth spurt accentuates individual differences. Growth is very rapid during this period, and individuals vary in the age at which they experience the rapid growth. It is perfectly normal to mature earlier or later than average. The growth of boys and girls occurs at different times, making for marked differences in nutrient requirements between males and females. Even within the same sex and among those of the same chronological age, there are tremendous differences in nutrient needs, depending on when the growth spurt occurs.

Most girls experience the adolescent growth spurt about two years earlier than most boys. The average age period of most rapid growth for girls is about 10½ to 13 years, while for boys it is about 12½ to 15 years. In spite of the fact that they experience the growth spurt later, boys grow more in height and weight during adolescence than girls. Thus, on the average, males end up the larger and taller sex. Generally, seventh and eighth graders are at the stage where girls are taller and heavier than boys. This may be a source of embarrassment and self-consciousness for both sexes. Adolescents need to realize that this condition is both temporary and normal.

Developmental Age

Developmental age is not necessarily the same as chronological age. Each person grows and matures according to individual inherited patterns. At any given age, different individuals will be at different stages of development. Developmental age can be measured in several ways. Each component of developmental age tells us something about the changes that take place during growth and development. Some components of developmental age are -

- *Skeletal age* can be assessed by a physician's evaluation of x-rays of certain bones. Several changes occur in the bones as the person grows and matures. The bones mineralize, or deposit calcium within the protein framework of the bones. This creates dense, hard, "ossification centers" which show up opaque on an x-ray film. The number and size of ossification centers is an indicator of skeletal development. In addition, the ends of the long bones provide an index to developmental age. In the immature bone, there is a horizontal "gap" near the end of the bones, which is actually an area of soft cartilage that will eventually become mineralized and form hard bone. As the bone grows longer, more cartilage is formed. The layer of cartilage is called the "epiphysis" or "growth plate." As the individual matures and the bones achieve their total length, this cartilage layer narrows and eventually disappears, a process known as "epiphyseal closure." The degree of epiphyseal closure can be assessed by x-ray.

- *Dental age* may be assessed by noting the number of temporary and/or permanent teeth that have erupted. This method of assessing developmental age has value mostly for younger children, since teenagers usually have twenty-eight permanent teeth. The appearance of wisdom teeth is so unpredictable as to be useless for this assessment. (See also the curriculum guides for Dental and Oral Health.)

- *Sexual age* can be assessed by noting the appearance of secondary sex characteristics in both sexes, and menarche in girls.

- *Morphological age* is based on the fact that as the person matures, the proportional size of different parts of the body change. For the newborn, the head is about one-fourth of the total length; while for the adult the head is only about one-eighth of the total height. These changes occur because different parts of the body grow at different times. The head and brain do most of their growing during prenatal life and infancy. The reproductive organs grow rapidly during adolescence. The legs also become much longer during adolescence. All these changes add up to a change in proportion and shape as a person matures.

  The differential timing of growth in different parts of the body is the cause of much of the awkwardness characteristic of adolescence. A sudden lengthening of legs and arms often results in difficulty adjusting coordination to the new proportions. Similarly, during prenatal development, the forehead and upper portions of the face develop before the chin and jaw do. This enables the newborn baby, who has practically no chin, to nurse. However, it can create a temporarily awkward profile for the adolescent whose chin and jaw hasn't yet caught up with the rest of the face.

Physiological Homeostasis

Every animal lives in two distinct and separate environments; *external environment*, the properties of which can and do vary widely, and the *internal environment* which is represented by the body fluids; blood plasma, lymph, and tissue fluids that surround all cells of the body. No matter how the external environment may change, the properties of the internal environment must be kept within very narrow limits for life to be maintained. The internal environment may fluctuate only a point or two on the alkaline-acid scale or a few percentiles in content of blood, sugar, copper, or iodine. Organisms are composed of dynamic and unstable materials, but are still able to maintain a relatively constant internal environment even as the external environment varies greatly. The coordinated physiological processes that maintain most of the steady states in the organism are complex and unique to living beings. *This condition in the living organism by which variation occurs, but within defined limits, is called homeostasis or inner constancy.* Homeostasis is the maintenance of the chemical balance or equilibrium.

To maintain homeostasis, people must have access to the balancing factors necessary for this process. Unless one can obtain what is required, and convert or eliminate what is in excess, inner constancy cannot be maintained. When the individual is unable to maintain inner constancy, illness results. Each person has the capability to adapt to a great variety of external environmental stresses.

These stresses affect body chemistry and require the body to react in such a manner as to return itself to inner constancy. One can maintain homeostasis provided external stresses are not excessive, accumulated, or too sudden in advent.

Nutritional status is an integral part of maintaining homeostasis and thus physical health. An individual's nutritional status is determined by an interaction of nutrient intake with inherited characteristics, disease, environment, and physical activity. It is rarely possible to be in good health without being adequately nourished. However, being adequately nourished does not insure a constant state of good health since heredity and environment are also factors which influence one's health. The body requires food energy and other nutrients to carry on the vital functions of building new cells for growth and repair, of supplying energy for physical activity and vital processes, and regulating body processes.

The normal human body is well equipped to digest, absorb, and utilize nutrients from food to maintain homeostasis. This state of dynamic balance exists with respect to intake and outgo of energy and nutrients by the body. An organism in a dynamic state is doing work, and is using energy to do that work. Examples of organisms in a dynamic state are: a moving animal, a growing plant, a muscle being flexed, and the human body digesting food.

A severely deficient or excessive intake of food energy (calories) eventually results in poor health because the body is unable to maintain homeostasis without extreme effort. Food energy may be derived from food or from stored energy (body fat or glycogen) that was derived from food previously eaten. Too little food energy for needs may result in loss of body tissue, lassitude, and decreased metabolic rate and eventually death if the deprivation is severe. Too much food energy results in the deposition of body fat, resulting in weight gain, and a variety of associated health risks. The reasons a person may take in too much or too little food are many and complex. They will include, however, the availability of food, emotional stresses, and very high or very low needs for calories. Usually a combination of reduced food intake and increased exercise is a most effective way of restoring energy balance.

How well nourished a person is depends not only on the kinds of foods eaten, but also on the individual's need for nutrients and how well the body uses the foods eaten. Need for nutrients varies with body size, age, sex, growth rate, physical activity, and individual metabolic rate. Pregnancy and lactation accelerate the need. Nutrient needs are also generally increased by infections and by the presence of parasites. Many diseases affect the absorption, utilization, or need for nutrients.

EFFECTS OF NUTRITION ON HEALTH

Introduction

People are growing taller at younger ages today than they did in previous generations. There is reason to believe that this is at least in part due to improved nutrition during prenatal development and childhood. Yet, many factors other than nutrition affect stature. The most important is heredity---including racial influences. Instances in which nutrition may be assumed to play a major roleare in groups where genetic variations are at a minimum; such as differences in succeeding generations of the same family or racial group. For example, studies of Japanese-Americans indicate that on the average, first-generation Japanese - Americans are taller than their parents who grew up in Japan twenty or more years before. Improved nutrition may be at least partially responsible for this difference. The presence or absence of disease also plays a part.

Young people are maturing sexually at an earlier age than they did several generations ago. In Western countries in the past 200 years, for example, the average age of menarche has gone from age 17 to age 12½ years. The same trend is beginning to show in eastern countries as general health improves.

Whose Responsibility is Nutrition?

The responsibility for nutritional health rests with the individual, the family, and the community. Individuals and families have a responsibility to choose food wisely and to make their feelings and opinions known on matters that affect their nutritional well-being. Local, state, federal, and international agencies are involved with various aspects of food and nutrition. For example, one of the responsibilities of the United States Department of Agriculture is nutrition. However, increased consumer awareness of good nutrition and an effective lobbying group in Washington can result in better nutrition being available for all Americans.

Since infants cannot chew, their basic food is milk. However, since cow's milk does not contain enough vitamin C to meet the infant's needs, once the infant reaches the appropriate age, orange juice provided daily will fulfill the requirement. Milk also lacks iron. Generally, full-term infants have enough iron stored to last three to six months after birth, and, at this time, iron-rich and iron fortified baby foods must be introduced. Pureed foods are necessary for infants up to nine or ten months of age, but by this time, they have sufficient chewing abilities to begin to eat some solid foods.

By the time infants reach the toddler stage, they are usually eating with the family and their diets reflect their family's diet. Preschoolers have proportionately high nutritional needs in relation to the volume of their food intake. Thus, the foods they eat need to be rich sources of all nutrients.

Adults need to consume all the necessary nutrients in sufficient quantities while maintaining a desirable weight. Since the rapid growth of childhood has ceased, nutrients are used mainly for repair and maintenance of the body, as a source of energy, and to regulate body functions.

Criteria for Assessing Dietary Adequacy

While nutritional status can only be assessed using clinical, biochemical and dietary methods, we have some standards for measuring the adequacy of people's diets. These are based on average requirements for individuals of a given age and sex.

Recommended Dietary Allowances (RDA) are recommendations for daily amounts of nutrients for people in given age and sex groups in the United States. These recommendations are higher than minimal requirements to allow for a margin of safety, and are revised every five years. They are published by a committee of scientists from the Food and Nutrition Board of the National Research Council of the National Academy of Sciences. The recommendations are used for planning food supplies and evaluating diets of groups of people. They are not meant to be hard and fast standards for individuals.

The RDA are designed to provide good nutrition for all healthy persons in the United States. Many other countries also develop standards for the purposes of dietary planning and evaluation. Each country has its own philosophy about what basis it will use for its standards.

However, there are some common errors in using the RDA; for example:

- Placing undue significance on small differences between dietary intake of a nutrient and the RDA for that nutrient. Intakes less than the RDA don't necessarily mean that a person is malnourished. However, there is an intake level, which, if chronically consumed, can place a person at risk for malnutrition. Two-thirds of the RDA have been assumed to be of such a level.

- The RDA tells one how to interpret food consumption data for groups of people. We never know the precise nutrient requirements of specific people, but on a group basis, we know that the risks of inadequacy for groups increase as intakes fall below the average recommended intake.

- Considering each nutrient alone makes it difficult to deal with interactions among nutrients. For example, the iron in meat is more available than in most vegetables and the inclusion of meat in the diet improves the utilization of iron in vegetable products, and, as we have seen, the inclusion of vitamin C in the meal also improves iron use.

A Balanced Diet

While the nutritional quality of food can be secured by eating a variety of foods from the Basic Four Food Groups, the size and amounts of servings must also be taken into account to achieve a balanced diet. To establish and maintain desirable weight the total number of calories consumed should approximate the body's use of calories in all its physical and mental activities.

Consideration should be given to the regularity of supplying nutrients to the body. Skipping breakfast deprives the body of fuel for energy for physical and mental activities during the morning. Snacks have been found to make a significant nutrient contribution.

Dietary adequacy is much better judged on the basis of the whole day's intake than on the basis of the contents of one meal. Each meal does not necessarily have to be "balanced" if the whole day's intake is adequate in all respects; i.e., not every category of the Basic Four Food Groups needs to be represented at each meal, although it is desirable to have a complete protein food at least two meals or during snacks.

Nutrient requirements vary with each individual, therefore individual needs and requirements will affect the specific foods chosen to eat. Knowledge of the relationship between nutrients and health gives one the basis on which to select foods that will provide the nutrients needed.

The Basic Four Food Groups

The "Basic Four Food Groups" is a guide based on the RDA for foods to be eaten to provide an adequate diet. This section should be presented as an opportunity to analyze the reasons for the recommendations. The Basic Four should be considered only as a guide and a tool for improving nutritional practices.

Many sources place the meat group first, milk second, and vegetables third, and breads and cereals last. Here the order is rearranged purposely to emphasize relative importance. Studies show that the type of food that Americans are least likely to avoid is meat. On the other hand, many people, (especially teenagers) are likely to have low intakes of calcium and iron. Further, the combination of milk products and cereal products produces a high quality protein meal, and is probably the best food value for the money of any combination. This can be quite important when money is limited. Therefore, the milk group is placed first.

The division into Food Groups is on the basis of their nutrient content. The groups are:

1. *Milk group.* The milk group (milk, cheese, cottage cheese, yogurt, ice cream, buttermilk) contributes calcium, vitamin D, riboflavin, and protein to the diet. At least four servings a day are recommended.(One cup of milk equals one serving.)

2. *Grains group.* The bread and cereal group (all enriched and whole grain breads and cereals) is important for food energy, iron and several B vitamins (i.e., thiamine, riboflavin, and niacin). Whole grain breads and cereals are natural sources of these nutrients. Milling grain to make white flour removes some of the nutrients, and enrichment simply means restoring the major nutrients to the flour. At least four servings a day from this group are recommended. (One slice of bread or one cup ready-to-eat cereal or 1/2 cup cooked cereal equals one serving.)

3. *Fruit and vegetable group.* The fruit and vegetable group includes all fruits and vegetables, and contributes mainly vitamins A and C to the diets. Some vegetables and fruits are good sources of minerals and are good energy foods. Good sources of vitamin A are the yellow vegetables, such as pumpkin, carrots, and winter squash. Good sources of vitamin C include citrus fruits and juices, tomatoes and tomato juice, raw cabbage, melons, strawberries, green peppers, and potatoes. Although potatoes are not as rich a source of vitamin C as the others listed, it may be important because of the quantities eaten by some people. It is important to note that french fries and potato chips have little vitamin C,

because it is lost in the preparation of these products.

A good vitamin C source should be eaten every day, and a good source of vitamin A should be eaten several times a week. The differing recommendations for vitamin C sources and vitamin A sources are based on the fact that vitamin A, which is fat soluble, can be stored in the body. Vitamin C is water soluble, and cannot be stored in the body to any appreciable extent.

Some sources recommend four servings of fruits and vegetables a day. (One-half cup cooked or juice, or one cup raw equals one serving.) This is based on the theory that four servings a day will probably provide enough variety that adequate vitamins C and A will be consumed. Actually, four servings are not necessary if the one or two vegetables or fruits eaten supply sufficient amounts of vitamins A and C. For those on limited incomes, this has some importance. A well-chosen combination of vegetables and fruits (cabbage and carrots; tomato and spinach; a citrus fruit and sweet potato) is adequate.

4. *Meat group*. The meat group might be more accurately called the "protein group," for it includes other protein foods besides meat, such as fish, poultry, eggs, dry beans, and nuts (including peanut butter). Iron and the B vitamins are also provided by the meat group. At least two servings a day are recommended. (Two ounces meat, or two eggs or two slices cheese, one cup dried beans or peas or four tablespoons peanut butter equals one serving.)

Margarine, sugar, soft drinks, beverage alcohol, candy, jam, and sweet desserts have been left out. These contribute calories to the diet, and on occasion some other nutrients as well, but they are not reliable sources of nutrients, and given the prevalent American dietary pattern, they do not need emphasis.

Nutrient Density

Another approach to designing and planning diets has been proposed. It is one that basis dietary standards on nutrient density or a nutrient-calorie ratio. The assumption is made that in the United States calorie needs are not a problem and are usually met.

$$\text{Nutrient density per } \frac{\text{1,000 kilocalories = RDA for a nutrient}}{\text{caloric (Energy) RDA for age and sex}} \times 1000$$

This approach uses the conversion of the Recommended Dietary Allowances of nutrients into recommended levels per 1,000 kilocalories by dividing the recommended intake of each nutrient by the caloric recommendation and then multiplying the answer by 1000. For example, the caloric requirement for a male, 15 to 18 years old is 3,000 kilocalories and the vitamin A requirement is 5,000 International Units (I.U.) The nutrient density ratio would be

$$\frac{5{,}000}{3{,}000} \times 1000 = 1{,}666 \frac{\text{I.U.}}{\text{1,000 k.cal.}}$$

The vitamin A nutrient density ratio for a female, 15 to 18 years old would be

$$\frac{4{,}000}{2{,}100} \times 1000 = 1{,}900 \frac{\text{I.U.}}{\text{1,000 k.cal.}}$$

From these data, a recommendation of about 2,000 I.U. per 1,000 k.cal. would appear to serve reasonably well for all groups.

The planning of diets requires considerations of factors other than estimates of nutrient needs. For example, diets should be planned which are acceptable for groups of mixed ages and sex, as this is the way most people eat. Food supplies and food habits are also relevant. Standards based on nutrient density may be most useful for this purpose.

Measurement of Nutritional Status

Nutritional status is the condition of an individual's health as influenced by intake and use of nutrients. One's nutritional status is determined from the correlation score obtained from physical, biochemical, and dietary studies.

A general clinical examination by a physician will uncover overt signs of nutrient deficiencies. However, there are other measurements that can be used to determine nutritional status when problems are less overt and more difficult to detect. Some direct methods are:

- *Growth progress*, which can be measured by change in height and weight, head circumference, skinfold thickness, hand-wrist x-rays, dental examinations, and appearance of secondary sex characteristics.
- *Biochemical measurements* of nutrient levels in blood and urine which give information about nutrient status.
  - *Blood sampling analysis* allows measurement of nutrients in transport in the body.
  - *Urine analysis* usually measures either excessive amounts of a nutrient or the breakdown products of a nutrient.
- *Tissue samples* are the most direct way of measuring nutritional status. Such techniques as liver biopsies and bone marrow sampling are informative, but cannot be used on a large population because they are difficult, costly, and uncomfortable to the subject.

Accuracy and interpretation of these measurements vary. For instance, blood vitamin A levels reflect long-range intakes of vitamin A and are not affected greatly by day-to-day fluctuations in intake. Hemoglobin levels, however, respond rapidly (in a matter of days or weeks) to a change in iron intake.

Some indirect indices that may detect changes in *national* nutritional status are:

- *Census data*, which furnish age, sex, and size of the population at risk.
- *Reports* on climate, crops, natural disasters, food shortages, and possible and actual crop failures.
- *Family budget data*, food availability and prices, and unemployment data are helpful, as they will affect demand and consumption of certain food products and therefore nutritional status.

Nutrition surveys, using clinical, biochemical, and dietary information to determine how well or poorly people are fed, have been done in many countries of the world. In developing countries, it is relatively simple and inexpensive to detect malnutrition. The problem is in reaching those affected with preventive or curative measures.

Nutrient Deficiencies

Deficiencies of protein, vitamins, and minerals result in poor health and, if extreme, can cause clinical disease. Symptoms of nutrient deficiencies are related to the function of the nutrients in the body. Nutrient deficiencies can also result secondarily to a disease process regardless of a presumed adequate food intake. This is due to an increased nutrient demand by the body caused by the disease.

While students may be interested in the extreme forms of deficiency diseases, it is important that this subject be kept in proper perspective. Deficiencies of important nutrients do occur commonly in the underdeveloped and developing areas of the world. However, acute deficiencies of a single nutrient are far less common than milder, chronic deficiencies of several nutrients at once. Recent studies show that although the United States' population is not uniformly well-nourished, explicit deficiency conditions are not common. Studying the extreme effects of malnutrition should not leave students with the impression that these diseases are imminent if they do not eat the prescribed foods every day. Nutritional deficiencies take time to develop, and since nutrition is a long-term affair, it takes a chronic, consistent lack of a vital nutrient to produce symptoms or an illness. Teaching about nutrient functions will not be credible unless it puts deficiency diseases in this kind of perspective.

Some nutrients are stored in the body to a greater extent than others. For instance, vitamin A is stored in the cells of the liver. If a person is in good vitamin nutriture, it would take many months to develop a clinical deficiency even on a diet free of vitamin A. Scurvy, on the other hand, develops more rapidly because vitamin C storage in the body is very limited. When stores of the nutrient are exhausted, cellular function may begin to be impaired. Individuals classified as marginally nourished would not display clinical signs of deficiency, but neither would they have much in the way of tissue stores of nutrients. Biochemical measures can detect lowered nutrient levels in the body tissues. These are measured most often in the blood or the urine. Clinical signs and symptoms of deficiency disease occur last.

Stress increases the need for many nutrients. Stress, in a biological sense, is any condition that imposes extra demands on the organism. It may be of either a physiological or psychological nature. Examples of stress include emotional upset, a growth spurt, pregnancy, illness, or a fever.

Nutritional adequacy is especially important during times of rapid cell division. Thus, growth increases the need for nutrients and for food energy. Individuals who are growing show the effects of an inadequate food supply more quickly than the rest of the population because their needs are greater. These individuals are thought of as nutritionally vulnerable.

Nutrient Excesses

There is a definite relationship between overnutrition, health, and homeostasis. As indicated earlier, an excessive intake of some nutrients can cause illness because the body is unable to sufficiently convert or eliminate these excesses in order to maintain homeostasis. Some vitamins, if ingested in large quantities over a period of time, can cause serious illnesses known as hypervitaminoses. The vitamins that have known toxic effects are the fat soluble vitamins A and D. They are stored in the body and excessive amounts cannot be

excreted in the urine, as is the case with the water soluble vitamins. However, there is increasing evidence that excessive intake of some water-soluble vitamins may cause metabolic disturbances in some individuals. For example, for susceptible persons, excessive vitamin C intake could cause kidney stones, and large doses of niacin have been associated with abnormalities of liver function.

The daily consumption of a variety of foods from the Basic Four Food Groups will usually supply sufficient quantities of each vitamin for healthy individuals, particularly if attention is given to vitamin and calcium rich foods, such as orange juice, tomatoes, and green, leafy vegetables. The levels of vitamins found in a balanced diet are not high enough to result in toxic intakes of nutrients. Incidents of hypervitaminosis occur mainly from overdoses of multivitamin supplements. Vitamin pills or capsules should be regarded as drugs. If there is a need for supplemental vitamins and/or minerals for a specific reason, a physician should prescribe them. In the absence of a physician's recommendation, there is no valid reason for taking vitamin supplements.

ACHIEVING AND MAINTAINING THE BEST WEIGHT

Normal Weight Factors That Affect Body Weight

We realize that the food we eat is somehow related to how fat or thin we are, but the picture is much more complicated than that. The body needs food energy for activity, for growth, and for maintenance. This "maintenance" category can be measured as Basal Metabolic Rate (BMR) and varies rather widely among individuals. BMR measures the energy needed to keep the body temperature constant, and to keep internal organs, such as the heart, liver, and kidneys, working. The source of energy for the body is food. Food is composed of proteins, fats, and carbohydrates, which are metabolized in the body to yield energy. Energy is measured in calories (which when capitalized means a kilocalorie) which is the amount of heat energy required to raise the temperature of one kilogram of water one degree Celsius. Technically, this unit is written with a capital letter - thus, Calorie. However, in popular literature the lower case (calorie) is most often used. Weight for weight, fat yields over twice the number of calories that protein or carbohydrate provide. So foods with a high fat content are the concentrated sources of calories in our diets.

Exercise makes a difference in body weight. Even though it takes a good deal of exercise to use up the caloric equivalent of what may seem to be a small amount of food, exercise can make a difference. The best kind of exercise is the kind that one does every day. Then the few extra calories used become significant. A habit of walking, instead of driving, or playing in a sport instead of being a spectator, can make a real contribution in keeping excessive weight under control. There is no doubt that increased physical exercise would be of benefit to most people in the United States, in terms of weight control, in relation to heart disease, and total fitness.

Exercise helps to maintain a healthful integrity of the functioning of all organs of the body. It improves the tone and quality of muscle tissue and stimulates the processes of digestion, absorption and elimination. Vigorous exercise strengthens the cardiovascular system resulting in improved transfer of oxygen and nutrients to the cells and the elimination of carbon dioxide and other impurities from the cells. It is important to recognize that an exercise program should fit individual needs and capabilities. An effective program may include a combination of walking, jogging, dancing, calisthenics, isometrics, and recreational sports.

Body weight can be affected by food intake and by exercise, but heredity determines body build and thus has the greatest influence on body weight. Bone structure, muscle configuration, and fat distribution are all part of basic body build, which is strongly influenced by heredity. Bone structure cannot be changed; muscle development can be changed only within narrow limits; total body fat can be changed, but its distribution usually cannot be altered. Some people are tall and lean, others are heavy and large-boned, others soft and round. These variations are normal. Heredity also determines the proportions of the body. For instance, two people the same height may look quite different because one has long legs and a short trunk, while the other has short legs and a long trunk.

Understanding the role of body build in the determination of body weight is important, otherwise goals for controlling body weight may be unrealistic. It is not at all realistic for a heavy-boned individual to diet to become a wispy, elf-like creature, because it simply will never happen.

Studies have shown that many teenage girls feel they are too fat; they diet to lose weight when they are not really in need of reduction. A heavy skeleton may make the scales read high for an individual; and for her, dieting will never enable her to achieve the slender look of a fashion model. One of the most important aspects of teenage weight control is helping them to accept themselves as a unique person and to set realistic individual goals, which also means wise selection of foods.

Metabolic imbalance has also been identified as a factor that can influence body weight. An endocrine basis for overweight, or obesity, however, is uncommon. A disturbance in the functioning of one or more of the ductless glands--either the thyroid or the pituitary--may affect weight, but it has been estimated that only 1 to 5 percent of all cases of overweight conditions result from endocrine or direct physiological cause.

Weight versus Fatness

Overweight refers to a condition of 10% above ideal weight, while obesity is 20% above ideal weight. Body weight is the sum total of a number of different body components. Variations are seen in the amount of fat, muscle, and bone. An individual may be overweight because of an excessive amount of bone, muscle or water. An athlete with a heavy musculature may be considered overweight but not obese. An individual is considered obese only if there is an excess of adipose tissue. However, people of average weight may be obese if their bone structure or musculature is small.

"Desirable" weight refers to a range of weights for a given height that have been compiled by life insurance companies. Insurance company studies have shown that overweight policy-holders are poor insurance risks, and some companies refuse to insure overweight persons. According to the U.S. Public Health Service, 25-45 percent of all Americans over 30 years old are more than 20 percent above their desirable weight.

Excessive weight gain is associated with certain ages of physiologic conditions. In women, weight gain commonly occurs after growth ceases, (at about age 20), during pregnancy, and after menopause. Men tend to gain weight between the ages of 25 and 40 years, after which this weight gain is usually accelerated with age.

We can change fatness by changing our eating and exercise patterns. Some people may always be "overweight" or "underweight" by the charts because of their bone structure, even if they are not too fat or too thin. At all ages, females have a larger proportion of their bodies as fat than do males. Also, as the adult grows older, active lean tissue is gradually replaced by fatty tissue even though weight remains constant.

We usually measure weight rather than fatness. The tables regarding normal body size are based on weight. This is because there haven't been any very efficient measurements for fatness developed. However, there are some ways of measuring fatness that are now in use, such as measuring skin-fold thickness; but these techniques are not usually used in the physician's office. (See also "Obesity" on page 84).

Evaluation of Weight Status

The best way to tell whether one is too fat or too thin is to visit a physician and ask for a professional evaluation. The physician will take into account one's growth record, general health, looks and feelings. The physician's judgment on this is probably the soundest one can get.

Few people want to be fat or skinny -- or to feel that way. The best weight for individuals is probably the weight at which they feel best and look best -- regardless of what the size and weight tables say.

Health Implications of Obesity

Morbidity/Mortality. It is well known that, in the adult, obesity is associated with increased risk from several diseases including cardiovascular diseases, diabetes, high blood pressure, and with a lower life expectancy than the person of average weight.

Social/Emotional. At any age, obesity is a social and emotional handicap. Obese people are often rejected and psychological testing of obese children produces a personality profile similar to those of children who have experienced prejudice and discrimination.

Obesity: Transient or Persistent. It is important to distinguish between "transient obesity" and the long-standing, more serious type. It is very common for adolescents to experience a time of relative chubbiness just prior to the adolescent growth spurt. Once the growth spurt begins, the excess fat disappears, often within a few months. However, for the person who has been fat since childhood, the adolescent growth spurt probably won't alleviate the condition, but it does offer an opportunity for controlled intervention. This type of persistent obesity is serious because it is the most difficult kind to overcome.

Present research suggests that there are two kinds of obesity. One is characterized by the person possessing too many fat cells and is called *hyperplastic obesity*. The other is characterized by the person possessing fat cells that are too large, and is called *hypertrophic obesity*. It appears that early childhood obesity is primarily hyperplastic, whereas late onset adult obesity is hypertrophic. Hyperplastic obesity seems to be the most difficult to overcome. For this individual, it is well to get weight under control as early as possible, certainly during the teenage years.

Dealing with Overweight

Medical supervision can be an important step in controlling weight. The physician can help assess whether a problem really exists and just how serious it is, and can help one to make a plan of action taking into account individual circumstances.

Behavior Modification is almost always necessary in controlling obesity. In order to lose weight and maintain that weight loss, changes in eating and exercise habits must be made. The extent to which these changes must be made can be determined by evaluating eating and exercise habits. The techniques recommended for behavior modification have been developed by psychologists and adapted by nutritionists. Eating behaviors that contribute to weight gain in-

clude: constant nibbling, gorging at meals, or eating large bedtime snacks. These behaviors can sometimes be changed by rewarding the behavior which is conducive to weight watching. Commercial groups have been formed which help individuals lose weight by positively reinforcing weight watching behavior. Increasing the amount of daily physical activity is also essential to weight loss. An honest appraisal of one's own strong and weak points is necessary for developing a weight-reduction plan.

If there are several obese children in a school or a school system, it may be possible for an interested teacher or school nurse-teacher to form a program to help these youngsters lose weight or at least modify gain of weight. Recent studies have shown that group efforts can be successful among teenagers because the support of others is very important. Such a program should involve the school physician, school nurse-teacher, health educator, physical educator, home economics teacher, parents and, perhaps, professionals from the community. The program should emphasize helping the adolescents to change their eating and exercise practices to achieve weight loss and to maintain a desirable weight. The overweight individual should be reminded that it took time to accumulate the excessive weight and that weight loss will occur gradually. Teenagers should understand the reasons for losing weight and become familiar with the role of food, eating practices, and exercise in losing and maintaining weight. The earlier a program of weight control is begun, the better.

ADEQUACY OF TEENAGER'S DIET

Typical Diet

Some "typical" teenage eating practices may be harmful, but often they are only different. Frequently, adult criticism only tends to reinforce the motives for being different and asserting independence. There is nothing wrong with spaghetti and meatballs for breakfast, for example, even though many adults may shudder at the thought. In helping to see the reasons for adult reactions, teenagers may come to see their own attitudes in a better perspective and to sift out the harmful practices from those that have a positive effect on their nutritional health. This does not happen, however, without a good nutrition education program which involves the teenager.

Teenagers are often chided for their eating habits. Frequent snacks, skipping meals, especially breakfast, fad dieting, different combinations of foods, and eating unusual foods at particular meals are some of the targets for criticism. Some of these practices (skipping meals, fad dieting) can be harmful nutritionally. Others (some snacks, for instance) may be of benefit from a nutritional point of view. Practices such as unorthodox combinations of foods, which can be quite nutritious are neither harmful nor beneficial in themselves, but often draw criticism simply because they represent a different way of doing things.

One's appetite during early adolescence is generally markedly increased due to the accelerated growth rate. This is especially true of those who are very active in vigorous sports. Teenagers may seem to eat all day long and to be less interested in eating with their families at dinnertime. Frequently, at this stage of life, teenagers eat their meals as well as in-between meal snacks away from home, often at fast-food establishments. Other factors that will affect the teenager's eating habits are: the school lunch program, food availability (a good example of this is the presence of vending machines in the schools and the kind of food they provide), income, and advertising. The educational level of the adult food provider in the home and whether she (he) is working outside of the home also has a direct bearing.

NUTRITIONAL CONCERNS OF TEENAGERS

Nutritional needs are high during the teen years but teenagers are individuals with their own unique desires and concerns for food. Good nutrition is essential for the health that teenagers need for appearance, energy, growth, and well-being. Teenagers are concerned about their body weight, (a subject that is treated more fully in the next section), and many teenagers suffer from acne. These teenagers sometimes avoid foods that they need and that do not necessarily aggravate acne conditions (most often milk) because a misconception exists that certain foods contribute to skin problems. There is no evidence that any specific food will make the condition worse, except in specific cases where an individual is allergic to a particular food.

Basically, acne is a disorder stemming from the rather sudden production of hormones and development of sebaceous glands during puberty. Oily skin and skin eruptions can be aggravated in some individuals by particular foods but the disorder is not caused or cured by any dietary practice. Mild cases can usually be controlled by scrupulous cleanliness, sufficient rest and exercise,

and a varied diet. Severe cases should be treated by a physician. The physician may have specific dietary recommendations to make on an individual patient basis. In the opinion of many nutritionists and physicians, restriction of iodized salt is not called for in treatment of acne, especially in a goiter belt. The health risk from iodine deficiency outweighs any risks from a possible aggravation of an acne condition. However, some physicians do restrict iodized salt in severe cases of acne.

Some teenagers modify their diets to conform to what they believe will increase their athletic performance. There is no scientific evidence to support the theory that a special diet will enhance athletic performance. An adequate diet providing ample food energy, protein, vitamins, and minerals is essentially the same for the athlete as for any other individual except for the athlete's increased need for calories due to greater physical activity. A common belief is that athletes need extra meat. This has no real basis in fact. Protein needs depend on body size and growth rate. Physical activity increases the need for calories, but not for protein except in the slow and gradual process of muscle development. Many coaches have training rules that dictate strictly what the athletes may and may not eat. These rules may or may not help to insure an adequate diet. "Special" foods may have psychological value even if there is no physiological reason for eating them.

Attempts to keep just under or just over an arbitrary weight for wrestling purposes can result in some really bizarre and hazardous dietary manipulations. Purposeful dehydration should never be undertaken for weight loss. Methods such as crash dieting, self-induced vomiting, use of laxatives, and forced perspiration are very dangerous and should not be used.

Studies of Teenagers' Nutritional Status

According to the United States Department of Agriculture, females of ages 12 through 17 were found to have an average intake of calcium and of iron about 30 percent below the RDA for each of these nutrients, while intakes of thiamine and vitamin A were also below the RDA for this age group. Nutrient intakes of adolescent males were about 10 to 20 percent below the RDA for this age group. Nutrient intakes of adolescent males were about 10 to 20 percent below the RDA for calcium, 20 to 30 percent below the RDA for iron, and the thiamine intake was also below the RDA. However, since the RDAs include a margin of safety, these figures may not indicate significant deficiencies of these nutrients. In the Ten State Survey it was reported that adolescents between the ages of 10 and 16 years had the highest evidence of unsatisfactory nutritional status of any of the age groups surveyed. The general conclusions from these and other studies indicate that:

1. most teenagers are well-nourished, healthy individuals;
2. many teenagers are concerned about their weight (often girls want to lose, boys want to gain);
3. snacking is common, and in some cases is a benefit to the diet;
4. diets are most often inadequate when fewer than three meals a day are eaten;
5. girls tend to have more difficulty getting an adequate intake of nutrients because they need fewer calories than boys;
6. the nutrients most often in short supply are iron and calcium, with low intakes of vitamins C and A.

Most problems of teenage nutrition reflect the general problems of the United States population, but may be accentuated by the high nutritional needs of adolescents. With one out of ten teenage girls becoming pregnant, the need for nutrients is further accelerated to avoid risk to the mother and infant. Weight control, low or nonexistent stores of iron in females and possible low intakes of calcium and vitamins C and A are nutritional problems in the general population. In addition, the intense concern of adolescents with their own bodies provides particular attraction to fad dieting. There is evidence that teenagers from lower socio-economic backgrounds consume less adequate diets than their more affluent peers, but American teenagers as a group are relatively well-nourished. Supportive encouragement is advised, with special attention in nutrition education efforts that help teenagers connect specific foods with specific nutrients with special emphasis to those foods that supply calcium and iron in their diets. Additionally, teenagers need to be helped in gaining new insights about parenting and the need for maintaining health during the prepregnancy period.

Fad Diets

There is no easy or magic way to lose weight. There is no particular food or combination of foods that will make one lose weight. The way to slim down is to decrease total food intake and to increase total exercise. However, at the same time, growth needs must be protected. Fad diets and reducing gimmicks are generally ineffectual. Most fad diets are not adequate nutritionally. They can seriously shortchange a person on proteins, vitamins, and minerals, and may endanger health.

Most of the fad diets are the low-carbohydrate diet approach to weight reduction. These diets are generally advertised as permitting weight loss with a calorically unrestricted diet. The initial weight loss experienced by persons on these diets is loss of body water. Because of the grossly unbalanced diet, that is,very low in carbohydrates and very high in protein and fat, the person may experience a loss of appetite and thus start to lose weight. However, it is unlikely that such a diet can provide a practical basis for long-term weight reduction or maintenance. Often nausea, fatigue and dehydration are side-effects of these diets. Also,a diet which is high in fat could be responsible, on a long term basis, for accelerating atherosclerosis.

Fad diets *seem* to offer a simple, easy way to weight loss. Actually they seldom succeed because they usually so restrict food that it is impossible to stay on them for very long, and many could be dangerous to the person's health. Any diet that limits food to a few items probably will not be adhered to over a period of time, and it is not likely to be nutritionally sound.

Fad diets often are promoted in paperback books. Vulnerable teenagers accept such promotion as truth because it is printed. Publishers do not distinguish between nutritional sense and nonsense and some of the ideas that are promoted are not supported by the scientific and medical communities.

There is a booming business in useless reducing aids, ranging from candy to pills. There are many producers who take advantage of the desire of the obese person to lose weight. Often these items are a waste of money and. especially so in the case of the diet pills which may be very dangerous. Of

special significance is the ingestion of diet pills in combination with other drugs. There is a likelihood of many pupils possessing a variety of misconceptions about diet aids and pills which should be dispelled. A sound background of knowledge is the most effective means of improving eating behavior. Help students to analyze and see for themselves the fallacies in some of the "simple" ways out of the weight problem. Students should understand their own emotional needs and how these needs are falsely satisfied through the claims made by nutrition charlatans.

Anorexia Nervosa

Anorexia nervosa is a psychiatric disorder that is characterized as obsessive self-starvation that can result in death. Those who suffer from anorexia nervosa are almost always female Caucasians between the ages of 13 and 30. Only 4 to 6 percent of the victims are male; none has ever been reported among blacks. Although anorexia nervosa once was thought to be rare, doctors now estimate that the illness, which is on the rise in the U.S., Britain, Sweden, and Italy, occurs in one out of every 100,000 "well-off" girls. Most anorexia nervosa patients are from middle or upper income families. They generally are high achievers, physically hyperactive, extremely well-behaved, and would be considered "model children" by ordinary standards. An authority on anorexia nervosa maintains that anorexic girls are drawn into the illness by their desire to gain prestige and acceptance in a society that places great emphasis on body appearance. They become caught up in overthinness. These girls believe they can achieve respect and special recognition by achieving thinness. It is felt that subtle family interactions may be at the base of the problem, and although the starvation and malnutrition must be reversed, psychiatric help for the anorexic and family is necessary.

NUTRITION DURING PHASES OF THE REPRODUCTIVE CYCLE

Preconceptual Period

A woman entering her childbearing years reflects the many influences to which she has been exposed throughout her own fetal period, infancy, childhood and adolescence. Adequate nutrition is important throughout the life cycle, but especially before and during pregnancy. The mother's well-being during pregnancy and her ability to recover rapidly from childbirth depend on her state of health, including her nutritional status. The nutritional status of the pregnant woman depends not only on what she eats during her pregnancy, but on her eating habits for a long time previously. This includes the long-term use of alcohol, tobacco and prescription and over-the-counter (OTC) drugs. These can affect the health of the mother and that of the fetus. Many authorities believe that nutritional preparation for pregnancy should begin very early in life. Adequate nutrition during the adolescent and early adult years before childbearing is important to the maintenance of good health and nutritional status during pregnancy. Thus, the nutritional status of a woman entering the childbearing age will depend on her entire previous experiences and will reflect the habits, attitudes, and values formed and developed during all her preceding existence.

Interconceptional Period

The interconceptional period -- the period between conceptions -- represents a strategic phase in the reproductive cycle in which several goals may be accomplished.

- o nutritional depletions of pregnancy and/or lactation may be rehabilitated
- o weight may be brought to desired levels
- o nutritional health of the entire family may be promoted

Family planning is also important during this time. Oral contraceptives, containing estrogen, are one of the most convenient and reliable forms of birth control. However, there are some metabolic effects associated with the oral contraceptive agents (OCA) which can alter the nutritional status of some women. Studies have shown that some women on OCA show an abnormality of tryptophan metabolism. Tryptophan is an amino acid which requires vitamin B_6 in order to be properly metabolized by the body. Investigators have shown that the irregularity in tryptophan metabolism is due to a vitamin B_6 deficiency. Depression, mood, and sleep pattern changes observed in significant numbers of women using OCA have been reported to be corrected with an increased intake of vitamin B_6.

OCA have also been implicated in altering the metabolism of another B vitamin, folate. There have been reports of tissue folate deficiency in women taking OCA. An account of three well-documented cases of megaloblastic anemia (which is an anemia caused by an interference in red blood cell formation due to folate deficiency) in women on OCA reinforces the suggestion that these agents may tip the balance toward developing a nutritional anemia in patients who are marginally deficient in folate as a result of malabsorption or dietary inadequacy.

Carbohydrate metabolism in some women may also be affected by OCA. There is a tendency for plasma glucose tolerance to decrease and for plasma insulin levels to increase when OCA are taken. Thus for these women, taking OCA is

associated with a pseudo-diabetic condition. The effect of OCA on lipid metabolism has also been noted. Increased levels of triglycerides and cholesterol have been observed in women on OCA. A thorough examination by a physician before OCA are taken, periodic check-ups during the period when OCA are being used, and an awareness of the increased nutrient demands OCA bring about in some women may help prevent any complications which might arise.

The intrauterine contraceptive device (IUD) is another popular method of birth control. In view of the frequent increase in menstrual blood loss associated with an IUD, women who use this method of birth control should have their iron status checked periodically and should include iron-rich foods in their diets.

Pregnancy

Adequate nutrition before and during pregnancy is important to both mother and baby. Nutrition has an important role in reproductive performance. Epidemiological data strongly suggest that good preparation for motherhood is based on good health background and good nutritional status. To be well nourished from childhood and to maintain a good diet during pregnancy helps to ensure safe, healthy pregnancies and healthy babies.

Importance of Prenatal Diet to the Baby. Studies show that when mothers are well nourished babies are healthier at the time of birth and complications of pregnancy are fewer. It is becoming more and more evident that an adequate diet during pregnancy will result in an increase in the infant's birth weight. This has been dramatically demonstrated in a study in Guatemala in which supplementation of mothers' diets during pregnancy resulted in an increase in birth weight of over half a pound. This concept is the cornerstone of certain newly introduced programs in the United States. One such program is the Women, Infants and Children (WIC) program which supplies food to pregnant women. (See page 90 for a discussion of this program.)

The risk of prematurity --- the greatest cause of deaths in very young infants -- is less when the mother is in good health, including good nutritional health. Maternal undernutrition before and during pregnancy can cause retardation of fetal development in size and weight.

The fetus depends on the mother's diet to provide building materials for its growth. The food the mother eats is digested and enters her bloodstream in the usual manner, but during pregnancy, the placenta transfers nutrients to the fetus. The blood of the mother and fetus do not actually mix, but they come close together in the placenta and nutrients and some drugs pass across the walls of the blood vessels from the mother's blood to that of the fetus.

The waste products from the fetus are returned to the mother's blood in a similar fashion so that they can be eliminated from her body. Nutrients, oxygen, and waste products travel between fetus and placenta through the umbilical cord. After the baby is born, the placenta is expelled from the mother's body and discarded.

The fetus builds up stores of some nutrients before birth. One example is iron. The normal full-term baby is born with enough iron stored in the liver to last several months. (This is essential, since milk - the only food for awhile - does not contain iron.) Another example is the fat stored by the fetus in the last weeks of pregnancy, which is important for the infant's ability to regulate body temperature after birth.

Importance of Prenatal Diet to the Mother

Most physicians recommend a total weight gain of the mother during pregnancy of 25 pounds, of which about one-third is the weight of the fetus. Adequate weight gain is now being stressed rather than overly restricting calories. Dieting during pregnancy is definitely not recommended. Weight that is gained over and above this represents fat that has been deposited and which must be lost after childbirth if the mother hopes to regain her former size and shape. The pregnant woman's need for calories is increased slightly, but not as much as her need for other nutrients. Most physicians and nutritionists recommend an increased intake of 300 calories per day for the pregnant woman, increasing the other components of the diet in a balanced manner, comprised of about 20 percent protein, 40 percent carbohydrates, and 40 percent fat. Therefore, although she may need to eat a little more than she normally does, she will have to choose her food with more care. There is little room for sweets and other foods that do not contribute the needed nutrients.

In addition to protein, carbohydrates, and fat, certain specific nutrients are required in larger amounts during pregnancy than at other times. Iron is particularly important because of the increase in the mother's blood volume, and in the fetal blood volume, as well, which also needs essential iron stores. During pregnancy, therefore, women should take in at least 18 milligrams of iron daily. Red meats, certain leafy vegetables and enriched cereal products are rich in iron. Most obstetricians routinely prescribe iron supplements for pregnant women. This is justified, as it is extremely difficult to meet the iron needed for pregnancy from the average American diet.

Calcium is another mineral which is needed in greater amounts during pregnancy for the building of fetal bones and teeth. Other minerals such as zinc, magnesium, manganese, selenium, and copper are also needed during pregnancy, but these are required only in trace amounts and an adequate supply can be insured by eating a well-balanced diet.

Requirements for certain vitamins also increase during pregnancy. Folic acid is needed in greater amounts as is vitamin B_{12} and perhaps vitamin B_6. Since an adequate supply of these vitamins may be difficult to achieve even with a good diet, many physicians advise the daily ingestion of a multivitamin tablet. This is especially important for women who have taken contraceptive pills for an extended period. As has been stated, prolonged use of oral contraceptives may lead to a deficiency of vitamin B_6 and folic acid. However, even the increased vitamin requirements of pregnancy are easily met by taking a standard multivitamin preparation. Enormous doses of vitamins should not be taken since they are not necessary and may be very dangerous.

When a vitamin is ingested in huge amounts, it no longer functions normally, and may cause adverse reactions other than those associated with the usual vitamin doses.

Every pregnant woman should receive individualized recommendations for her diet from a physician as part of a program of routine medical supervision during pregnancy. A physician should be consulted as soon as a woman suspects she is pregnant, and she should continue regular visits until she is discharged by her physician.

Teenage Mothers

There are nutritional, physiological, and psychological problems with which the pregnant adolescent girl has to deal. For girls under 15 years of age who are still growing rapidly, pregnancy carries higher than average risks of perinatal mortality. Because of this rapid growth, there is a competition between mother and fetus for nutrients. The incidence of premature labor and of toxemia of pregnancy (a serious condition of unknown origin characterized by high blood pressure, accumulation of fluid, and excessive weight gain) are greater for the adolescent than for the mature woman. This increased risk is correlated with a lower probability of regular and adequate prenatal care and factors associated with poverty.

Adolescent girls 15 years or older are nearly mature physically and sexually, but not necessarily behaviorally and emotionally. The nutritional status of adolescents is frequently influenced by the dietary intake of peer groups rather than by their families. The pregnant adolescent has not had a chance to build up stores of iron, trace minerals, and vitamin A, and mother and fetus are at high risk with respect to possible deficiencies of these nutrients.

There are social and psychological factors which may serve to worsen the problems of the pregnant teenager. Since many adolescent pregnancies occur out of wedlock, the pregnant teenager may attempt to conceal the fact that she is pregnant, or be so worried about the problems she sees resulting from the pregnancy that nutrition is the last thing on her mind. Cosmetic considerations may lead her to diet and to smoke to curb her appetite and "keep from showing." Fear of the pregnancy and depression may cause her to under-eat or to overeat foods high in calories to comfort herself. She may not seek professional prenatal care until late into pregnancy. The increased risk for teenagers is compounded by the generally inadequate medical care they receive. The outlook for the pregnant teenager is relatively good medically if she seeks and receives early and adequate prenatal care.

It is important for girls in adolescence to recognize and appreciate the relationship of adequate nutrition to successful pregnancy and the birth of a healthy baby.

Lactation and Infant Nutrition

Infancy is a period when food is very important for both physiological and emotional reasons. Milk is the food especially suited to the nutritional needs of infants. Breast milk is ideal for the infant, but in cases where the mother cannot, or does not want to breast feed her child, formulas based on cow's milk can adequately supply the needs of the infant. These formulas should be based on the recommendations of the attending physician since a nutritional supplement may be required.

Lactation is a physiological event which occurs in all women after childbirth. Failure to lactate is relatively rare (it occurs in only 1 percent of all women). The success of lactation is not only the ability to lactate, but to sustain sufficient lactation with satisfactory weight gain in the infant.

Breast milk is higher in carbohydrate and lower in protein and calories than cow's milk. Commercial infant formulas are formulated to resemble the composition of human milk more closely than cow's milk. Following is a comparison of the amounts of several nutrients in breast milk and whole cow's milk:

Composition per 100 milliliters	Human Milk Mature (30 days post-partum onward)	Whole Cow's Milk Undiluted
Calories	70.0	61.0
Calcium, mg	32.0	119.0
Carbohydrate, gm	6.89	4.66
Protein, gm	1.03	3.29
Fat, gm	4.38	3.3
Vitamin C, mg	5.0	0.94
Vitamin A, mg	53.0	34.0
Vitamin E, mg	0.56	0.06
Vitamin B_6, mg	0.011	0.042
Folacin, mg	5.0	5.0
Iron, mg	0.03	0.051
Riboflavin, mg	0.036	0.162

It is possible to provide both adequate nourishment and favorable emotional experiences for the infant with either breast or bottle feeding. Following is a description of the advantages and disadvantages of breast feeding.

Advantages

1. Breast milk is formulated for the infant's needs by nature.

2. The colostrum (the milk produced 1-6 days post-partum) is thought to provide some immunity against diphtheria, tetanus, pertussis, typhoid, dysentery, and other diseases.

3. Breast milk is more easily digested than cow's milk and gastrointestinal problems are less frequent in breast fed infants.

4. Some infants are allergic to cow's milk.

5. Breast feeding fosters a warm, close relationship between mother and baby. However, such a relationship can also exist between the bottle-fed baby and the mother if she holds the child and makes the feeding period one of warm and close companionship. Any woman who cannot or does not want to breast feed her infant should not feel guilty about it, but be assured that she can provide adequate nutrition and a warm emotional experience with bottle feeding.

6. Breast milk is always available, always sanitary, and economical to produce.

Disadvantage

Drugs ingested by the mother become incorporated in the breast milk. Most drugs ingested by the mother appear in her milk at a concentration of one percent of the ingested dose. This is a concern because the infant's hepatic and renal capacity to detoxify drugs is immature.

The mother's nutrient needs are greatly increased while she is breast feeding. She has a greater need for calories and some other nutrients than she did while pregnant. Nursing mothers need a diet high in protein rich foods; fruits and vegetables, milk and cereals.

In a reversal of trends seen 25 years ago, there has been an increase in popularity of breast feeding among groups with higher education and with the more affluent in the United States, and a decline in breast feeding among low-income groups. It is estimated that less than one-third of the infants of lower Socioeconomic Status (SES) families are breast fed even for a short period of time. The advantages of breast feeding (constant availability, sanitation, economy of production) are particularly great for the low-income mother and her child. It remains to be seen whether the increasing popularity of breast feeding in upper groups will spread to other segments of the population.

Nutritional Needs of the Infant

In addition to milk, the infant needs some vitamin D (supplied in fortified cow's milk or in vitamin drops if the infant is breast fed) and some vitamin C (supplied by vitamin drops or by orange juice) after the first few weeks of life.

At about three months of age, infants need some iron. This requirement for iron is related to the rate of growth of the infant, and the total body iron at birth. Initial hemoglobin measurements and birth weight are indicators of potential need. In the United States, most babies are introduced to enriched cereals (and often other solid foods) before this age. In many areas of the world, babies are seldom offered much solid food during the first year of life. In the United States, however, babies are usually introduced to a variety of solid (strained) foods early in life; often before they need them nutritionally.

Some physicians and nutritionists feel the additional calories supplied by the early introduction of solid food may predispose the baby to obesity in later life. The number of fat cells may be determined early in life and some investigators feel these unnecessary calories may increase the number of fat cells and make weight control more difficult later in life. This hypothesis is still being tested and no conclusive results have been obtained.

During the last part of the first year, the baby still drinks milk, but also eats a variety of solid foods - starting out with strained foods and moving gradually to eating mashed or chopped foods. Usually baby foods cost more than regular foods, but people often decide that the convenience justifies it. In some cases, baby foods are less expensive than mashing regular food (e.g., canned pears). In the case of fruits, baby foods have less sugar than regular canned fruit - an additional advantage.

There are a variety of vegetable-and-meat combinations marketed for babies. These are usually vegetable and cereal, with only a small amount of chopped meat added for flavor. It is sound practice to rely on "baby meats" rather than on these combinations as a source of meat. Products marketed as "high meat dinners" make a more substantial protein contribution than vegetable-and-meat combinations.

Custards packaged for babies are good sources of egg and they contain milk solids. Most of the desserts containing mainly sugar, with a little fruit and some starch, are not suitable foods to offer in any substantial quantity to a baby, as they crowd other more nutritious foods out of the diet. Foods high in sugar may also tend to help the baby develop a "sweet tooth" unnecessarily. However, baby food processors, in 1977, reduced the amount of sugar and eliminated salt in baby foods.

Baby food manufacturers have removed monosodium glutamate (MSG) from their products, after a study showing that large doses of MSG produced brain damage in young animals. There is little reason to believe that harmful effects occur in human infants, but nevertheless it is sound practice to leave MSG out of the foods. This flavor enhancer had been used primarily to make the product taste good to mothers and served no real nutritional purpose in baby food.

Older babies need to eat meat or meat substitutes, vegetables, fruits, cereals, and milk. The baby's needs for nutrients are high, so there is little need for candy, soda and other foods which provide little more than calories. These sugar rich foods are not suitable foods for babies or for growing children.

Many of the emotional needs of the infant are met by food. Much of the early experience of the infant is centered around the wanting, demanding, and receiving of food. Food is one important way that the infant learns about the world. If a baby is fed when hungry, if feeding takes place in relaxed, comfortable surroundings, and if food is offered by a loving person who holds and talks to the baby, the baby learns to trust and enjoy the world. If the baby is often left to cry with hunger for long periods, or if the feeding situation is impersonal, the infant may learn not to trust other people.

FOOD ECOLOGY

Environmental factors affect nutritional health by influencing what foods are available, the quality of those foods, and what foods the individual chooses to eat. Technology and government regulations are two chief factors that influence the kinds, quality and quantity of foods that are available.

Technology

Technology affects the foods available to people, and the nutritional quality of those foods. Agriculture and marketing are the two major areas of nutrition technology. Modern developments in agriculture, food processing, transportation, and food marketing make it possible for us to have a great variety of foods available the year around. Foods that formerly were limited to one geographic area or one season of the year are now in stores throughout the country all year.

Without food preservation methods most of the world's population would be faced with a "feast or famine" situation; a large volume of food with a wide selection during the short harvest period, followed by a long winter and spring during which there would be only a limited number of staples, such as the grains and a few root crops. The food preservation techniques in greatest use today do not result in major losses in the nutritive value of foods. The more sophisticated methods of food preservation now being developed may retain an even higher percentage of the nutrients. The question raised by many is the number and amount of additives being used, giving attention to the risk-benefit relationship.

Government Regulations

Government regulations affect the quality of foods available. The nutritional quality of some food is regulated by law. *Enrichment* of white bread and flour is mandatory in most states. During the milling process used in making white flour, much of the iron and B vitamins that are contained in the whole grain are lost. *Enrichment restores some of these nutrients.* Enrichment laws were made on the basis of the belief that almost everybody ate a significant amount of bread each day. Today it is obvious that some groups depend more on pasta, rice, or some other grain foods than they do on bread. Also, Americans are eating increasing amounts of unenriched sweet baked goods every year.

Fortification of some foods helps supply nutrients that would otherwise be difficult to obtain. Fortification differs from enrichment in that *fortification is adding a nutrient* that was not *originally present* in the food or that was not present in the amounts added. Examples of fortified foods are vitamin D milk, iodized salt, and vitamin A fortified margarine.

When a food is chosen as a vehicle for fortification, it is chosen because of its potential for getting the nutrient to the people who need it. For instance, salt is an appropriate vehicle for iodine because everybody needs iodine, the amount needed is very small, and almost everyone uses some salt. In the case of vitamin D, children have the greatest need. Vitamin D's function is in the absorption of calcium, so milk is the vehicle of choice, since it reaches children and puts vitamin D in the same product as the calcium.

For both enrichment and fortification, standards have been established setting minimum and maximum limits for the nutrients to be added. If these standards are adhered to, this avoids the possibility of consuming too much of a nutrient.

While enrichment and fortification have proven their value in improving the nutritional health of people, some producers take advantage of the "halo effect" of these processes to advertise their products as extra, super-fortified. The classic example here is the breakfast cereals. The claims made for these products often exaggerate their significance.

Food Labeling

In order to maintain good nutritional status, it is important to know the nutritional content of the foods we eat. This is especially so for people who are on restricted diets. For these reasons nutrition labeling can be a very effective tool. However, we must use nutrition labeling with caution. One problem is that nutrition labeling may actually mask nutritional values of the fresh or natural food for which a processed or synthetically contained food has been developed. For example, nutrition labeling can make products that are devoid of real nutritional value seem better simply because it is inexpensive for the food companies to fortify foods with 50% or 100% of the recommended daily allowance of a nutrient. How will a person looking at an orange drink made out of sugar and water and perhaps 10% orange juice, but which is fortified with vitamin C, distinguish between that drink and an orange? The orange isn't labeled. The nutrition label itself influences people. They know what the food value of the labeled product is, but they don't know what the food value of fresh food is. Without a good nutrition education background, misguided choices may be made.

Food selection that ensures better nutrition is dependent upon full information of the nutrient content of foods, expressed in ways it can be understood by the ordinary food buyer. The purpose of labeling requirements is to provide consumers with specific and meaningful information to help them determine the nutritional quality of the food they buy. Some of the information required by the Food and Drug Administration to be shown on the label includes the name of the product, the net contents or net weight, and the name and place of business of the manufacturer, packer or distributor. Some information is included on the label at the option of the manufacturer or processor. On most foods, the ingredients must be listed on the label. *The ingredient present in the largest amount, by weight, must be listed first, followed in descending order of weight by the other ingredients.* Certain additives used in the product must be listed, but colors and flavors do not have to be listed by name. The terms "artificial color" or "artificial flavor" may be used.

FDA has set "standards of identity" for some foods and their ingredients do not have to appear on the label. These standards require that all foods called by a particular name (such as catsup or mayonnaise) contain certain mandatory ingredients which do not have to be listed on the label. If a product is fortified by the addition of a nutrient or a nutritional claim is made in the labeling or advertising, that product must have full nutrition labeling. Foods that are sold for "special dietary use" are closely regulated to prohibit fraudulent or unscientific claims.

Nutrition labels tell one how many calories and how much protein, carbohydrate, and fat are in a serving of the product. They also tell the percentage of the U.S. Recommended Daily Allowance (USRDA) of protein and seven important vitamins and minerals that each serving of the product contains. The laws controlling nutrition labeling are being changed. Alert learners to watch for these changes.

Safe Food Supply

Government agencies are responsible for controlling the *sanitary quality* of the foods we buy. The Federal Food and Drug Administration has jurisdiction over foods that move in interstate commerce. It can and does seize foods that are contaminated or adulterated and remove them from the market. State agencies (in New York State, it is the Department of Agriculture and Markets) are responsible for regulating the sanitary quality of foods sold within the State. Strict regulations are established for perishable foods. Restaurants and other public eating places are subject to inspection for sanitary facilities and food handling. Local health departments employ sanitarians, who have among their responsibilities the inspection and reporting of such establishments.

There are some basic principles involved in bacterial intoxications and infections from food origin:

- The food first must become contaminated. Food handling practices play a major role in determining whether food becomes contaminated.
- If contaminated, the organisms must have an opportunity to grow, since food poisoning generally occurs only when large numbers of the organism are present. Food poisoning organisms grow best when the temperature is neither hot nor cold and when the food is high in protein, low in acid and high in moisture content.
- Some food borne microorganisms cause infections; e.g., salmonella, while others cause intoxication; e.g. botulism.

Some of the possible food borne illnesses are:

- *Bacterial Food Poisoning* - The distinctive feature of an outbreak of food poisoning is the sudden illness of several individuals following ingestion of a common meal. Usually a particular item of food served at the meal is the source of the poisoning.

  -*Staphylococcal food poisoning*, for example, is caused by a toxin formed in the food before ingestion. A wide variety of foods have been implicated, but the usual vehicles of the toxin are ham, poultry, cream and custard-filled baked products. The best prevention is cleanliness, elimination of flies, and adequate refrigeration.

  -*Salmonella poisoning* is primarily a disease transmitted by the fecal-oral route. The foods most often implicated appear to be poultry, prepared meats, desiccated coconut, cake mixes, custard-filled bakery products that are lightly cooked and subject to much handling, milk and milk products, and eggs. Appropriate heat in preparation, and refrigeration in storage are the main ways to combat growth of the organism.

-*Botulism* is the most serious of food poisonings because it may be fatal. It is most commonly caused by improperly processed home canned foods. This is good reason to boil all low acid home canned foods 10-15 minutes prior to consumption and to never taste a suspected canned food. Outbreaks of botulism are usually caused by the consumption of home-canned vegetables or other foods that are inadequately preserved, and inadequately cooked. The seriousness of botulism may vary from mild discomfort to death within twenty-four hours, depending on the amount of toxin ingested and the individual's response. Nausea, vomiting, and dizziness are the initial symptoms. The bacteria clostridium botulinum develops in the absence of air and thus can grow in the anaerobic environment of the can. All home-canned food should be boiled at least ten minutes before eating since boiling for this length of time destroys the toxin. Great care should be taken when canning foods at home to follow the directions and boiling times.

- *Food-and Water-Borne Diseases* - Milk and water have long been known as carriers of disease organisms, and now we know that other food, and food utensils are also carriers. Food, water and utensils can be contaminated with bacteria, parasites or poisons. Food-borne diseases are brucellosis, tuberculosis, typhoid fever, paratyphoid fever, scarlet fever, diphtheria, and a variety of other disorders. Sanitation programs in all food handling and food processing establishments must be enforced to avoid the possibility of people contracting these diseases. The handling of food in the home should also be done under sanitary conditions.
- *Food Poisons of Natural Origin* - Some of the most potent poisons to people are of natural origin, coming from plants, seeds, roots and animals. For example, certain varieties of mushrooms containing alkaloids are poisonous, rhubarb leaves contain considerable amounts of oxalic acid that cause illness, and many wild plants are poisonous. Clams and mussels found in the Pacific along the coast from California to Alaska in warm weather may contain a poisonous alkaloid similar to strychnine. The Puffer fish is also poisonous.
- *Pesticides* - Pesticides have played a major role in agriculture's phenomenal success and are expected to continue as the chief deterrent against pests that menace production. A disadvantage in their use is the poisonous materials they contain that give rise to harmful residues. The effects of pesticides on other organisms in the environment and varying amounts of residues on agricultural produce have been the subject of much debate and controversy in recent years. The current system for regulating residues on food is based on the "tolerance principle" which assumes that all pesticide chemicals can be poisonous at high levels, while there are low levels at which injury does not occur. There is evidence that, in general, adherence to these tolerance levels is not deleterious to one's health, although longitudinal studies assessing the impact of these chemicals over an extended period are still being conducted.

Additives

Additives are a variety of chemicals added during the production, processing, and storage of many foods we eat. A chemical additive may be either nutritive or non-nutritive. Additives may improve the nutritional value, appearance, texture, and flavor of foods. Some additives, such as preservatives, do not improve the food's nutritional value but retard rancidity and spoilage. Without additives in food, urban communities in the United States could not be supplied with sufficient quantities of untainted foods at lowest possible prices.

Dyes are another example of non-nutritive additives. To the consumer, color often symbolizes the difference between fresh and stale, between good flavor and poor. Experiments have shown that we avoid familiar foods when they are not colored in a way to which we are accustomed or think is the natural color. Colors have been added to foods for centuries to make them more attractive. It is the FDA's responsibility to make sure that these colors are safe. Effective February 12, 1976, the U.S. Food and Drug Administration revoked its approval of the artificial coloring Red Dye No. 2. The FDA decision was that Red Dye No. 2 could no longer be added to foods, drugs or cosmetics since it has been linked to cancer. This dye comes under the special provisions of the FDA's Color Additive Amendments of 1960. These amendments granted provisional approval of all color additives in use in 1960 until they could be demonstrated to be safe. Red Dye No. 2 lost its *provisional* status not because it was proven to be dangerous, but on the basis that it had not been proven safe under the guidelines of the amendments.

Because some foods, such as convenience foods, are not eaten immediately after they are prepared, they need special preservatives, antioxidants, and other additives to maintain their freshness over long periods of time. Convenience foods are prepared foods, such as TV dinners. They require little or no further preparation at home. Government regulations limit the amount and kind of chemicals used.

NUTRITION PROBLEMS IN THE UNITED STATES

Owen Study

The purpose of the Owen Study* conducted during 1968-70 was to investigate the nutritional status in a cross-sectional sampling of children throughout the United States. Dietary histories, clinical and biochemical methods were used to assess nutritional status. The major findings were:

- "Nutritional risk", (e.g., lowered dietary intakes, lower biochemical indices, and smaller physical size for age) was most prevalent in low socio-economic status children. Socio-economic status (SES) was measured by the Warner Index which rates occupation, source of income, dwelling type, and residential area.
- A large proportion of preschool children take vitamin supplements. People in all socio-economic groups apparently believe the misconception that multivitamins, "Keep you growing right even if you don't eat right." This is an expensive misconception.
- The primary determinants of nutritional status were found to be dependent on:

  -*budgeting* for food. Low SES people are careful to budget with respect to food, and food for children seems to be given high priority.
  -*food procurement*. This task is performed mostly by mothers, particularly in the upper SES.
  -*food preparation*. Most women like to cook and prepare new foods, but this is particularly true in upper classes.
  -*family eating practices*. Low SES mothers are more lax or permissive with respect to food. They tend to allow children to eat meals and snacks at any time of the day, cater to the children's food preferences, and use food as a reward and withhold food if a child has misbehaved. In contrast, upper SES children had more regularly established daily eating patterns and were "required" to eat well.

It was concluded that all that money does is provide the opportunity to eat well. It is how the above four factors are handled that determines actual nutritional status.

Hunger and Malnutrition

Hunger and malnutrition do occur in the United States. The existence of plenty of food for the vast majority of people in our country does not assure the nutritional health of all the people. Families and individuals with limited incomes are especially vulnerable to nutrition problems. They may not have the financial resources to buy food, and they are frequently less informed about good nutrition at minimal costs.

*"Nutritional Status of Preschool Children in the United States, The Owen Study"; Pediatrics, Vol. 53, 1974, p. 597.

Extent. It is difficult to document the extent of hunger and malnutrition in the United States. On the average, Americans are healthy and their nutritional status is good. Some of the most common nutritional problems are those of excesses; i.e., obesity. However, many people fare much worse than the average. It is well known that disadvantaged Americans --- those with low incomes, especially Blacks, Indians on reservations, and other minority groups--- are at a substantial disadvantage in terms of general health.

For the population as a whole, progress in health care in the United States over the past few decades has been impressive. Infant mortality has declined more than 200 percent since 1935; however, the United States ranks only ninth in the world in infant mortality rates. Sweden's infant mortality is the lowest in the world with a rate of less than 10/100,000 live births.

Maternal mortality rate in the United States has declined from 582/100,000 live births in 1935 to approximately 13.8/100,000 live births today. Life expectancy at birth has increased from 63.6 years in 1939 to over 72 years at present. However, the low-income segment of the population has not shared equally in these benefits. The effect of social, hereditary and environmental factors is reflected in the fact that the Black American has a seven-year shorter life expectancy than the White American. The disadvantage is also manifested in higher infant and maternal mortality rates, higher incidence of tuberculosis and hypertension, and other health factors.

Concern for the Nutrition of Poor Americans

Many events at the national level, several of which have been promulgated by the federal government, have served to increase the awareness of all Americans of the health and nutritional problems of poor Americans.

- *Senate Subcommittee Hearings on Hunger in Mississippi*. In the summer of 1964, a team sent to Mississippi discovered significant instances of malnutrition. The report they made to the Senate Subcommittee on Manpower, Employment, and Poverty shocked the nation, which resulted in further investigations.
- *Hunger USA and CBS' Hunger in America*. In the spring of 1968, the Citizens Board of Inquiry (a group formed by a number of churches and foundations) published the report, *Hunger USA*. Only a few weeks later, CBS News aired an hour-long documentary entitled *Hunger in America*. Neither of these reports was based on scientific studies, but instead presented case studies of hunger and malnutrition among poor Americans in several areas. Their emotional appeal was striking, and great concern was aroused.

  Both *Hunger USA* and the CBS program *Hunger in America* touched off a great debate in the scientific community. Unfortunately, both reports contained some scientific inaccuracies. However, they served the purpose for which they were intended---to arouse the conscience of the nation. Students may want to read *Hunger USA* with an eye to picking out some of the scientific inaccuracies.
- *Senator McGovern Committee Hearings*. The proceedings of the McGovern Committee hearings may be obtained from the United States Superintendent of Documents. In the summer of 1968, the Select Committee on Nutrition and Human Needs, chaired by Senator George McGovern, began hearings on the problems of malnutrition among the poor. The testimony given at these hearings has served

to further document the need for government action to help poor people obtain adequate food to maintain health.

- *White House Conference on Food, Nutrition and Health.* In December 1969, President Nixon sponsored a White House Conference on Food, Nutrition and Health to consider the problems of hunger and malnutrition in the United States.
- *Hunger 1973* is a report which was prepared by the staff of the Select Committee on Nutrition and Human Needs. In 1968, a Citizens' Board of Inquiry Into Hunger and Malnutrition in the United States identified 280 "hunger" counties, that is, counties which had more than twice the national average of persons in poverty, unusually high neonatal mortality rates, and poor records of participation in the Federal Food Programs. Since 1968, Federal Food programs have become more widely known and accepted. The purpose of this report was to document where poverty and federal food assistance were distributed in the United States and the degree to which there have been changes in that distribution. This committee wanted to determine whether every poor family had access to a food assistance program.

An understanding of how poverty is distributed in the United States in the 1970's was obtained from county-by-county census data. In 1973, most counties still had large percentages of poor, yet only one-sixth were still counted as "hunger" counties. Most appear to have made a serious effort to reach the poor since 1968. However, there were 50 "hunger" counties that remained in the listing five years later. Despite improvements and greater accessibility of the food assistance programs, these counties either cannot or will not take advantage of federal food assistance programs. New York State had no "hunger" counties in 1968 or in 1973.

Counties that do not have unusually high numbers of poor residents, but which fail to provide food assistance for two-thirds or more of whatever poverty population they do have were labelled "Failure-to-Feed" counties. New York State had nine "Failure-to-Feed" counties in 1973. These are Columbia, Delaware, Greene, Lewis, Livingston, Montgomery, Saratoga, Wyoming, and Yates counties.

Obesity

While affluent societies are trying to cope with the problems of providing some segments of their populations with enough food, the problem of malnutrition or overnutrition has been increasing. Obesity and vascular degenerative diseases are products of an affluent way of life in which nutrition education can play a significant role.

If undernourishment or overnourishment (obesity) occurs during cell division, the number of fat cells a person has as an adult may be altered. It has been observed by various investigators as a possible theory of the complex etiology of obesity that most obese adults have both a greater number of fat cells, as well as larger fat cells, than their normal weight counterparts. One can reduce cell size by decreasing food intake and increased physical activity, but cell numbers cannot be reduced. Therefore, it appears that overfeeding in infancy and childhood can lead to a higher number of fat cells which provides the person with a greater capacity to store fat. This in turn may lead to adult obesity and the health problems associated with it.

It has long been thought that a "fat baby" was a "healthy baby" because the excess fat represented a surplus of energy to help the infant withstand episodes of infection and stress. However, it has been found that the risk of infectious disease in infancy may actually be greater in overweight and obese infants. Also, the fat infant and child may be less able to maintain "ideal weight" as an adult.

One of the most common forms of malnutrition in the United States is obesity. The reported incidence of obesity in the American population varies depending upon the definition that is used, but there is general agreement that the incidence of obesity increases with age. Selective Service data indicate that the weight of men and women entering the military for any given height and age has increased over the past 50 years. Civilian studies show similar trends. Data do not exist to indicate an exact figure for the incidence of obesity, but studies of teenagers indicate that between 10 and 35 percent of adolescents are obese, depending on the population studied and the standards used.

Many factors in our way of life contribute to an increasing incidence of obesity:

- Most Americans have access to more than enough food to meet their caloric needs.
- Our appetites are not controlled by our actual need for energy.
- Everyday living demands less and less of us in the way of physical exercise.
- The American population leads relatively sedentary lives.
- Convenience foods and fast food establishments suggest increased consumption to us while making it easier to do the consuming.

The obese individual has a shorter life expectancy than does a person of normal weight. Obese individuals run greater than average risks of developing coronary heart disease, hypertension and diabetes. They also face increased risks in pregnancy and surgery. In general, the greater the degree of obesity, the greater the risk of a shortened life. (See also "Weight versus Fatness" on pages 63-64.)

Atherosclerosis and Coronary Heart Disease

Cardiovascular diseases account for more than half of all deaths in the United States. As our leacing cause of death, these diseases deserve a great deal of attention from the research scientist. Coronary heart disease, including atherosclerosis and coronary thrombosis, are common in the United States and in other technologically developed countries.

- *Cardiovascular disease* is any disease involving the heart and circulatory system.
- *Coronary heart disease* (CHD) is a disease of the coronary arteries (the arteries supplying the heart muscle itself.)
- *Atherosclerosis* is a condition characterized by the building up of fatty areas ("plaques") along the insides of arterial walls. These may eventually limit blood flow to the heart, causing coronary insufficiency, or block blood flow to the heart, causing a myocardial infarction.
- *Coronary thrombosis* is the blocking of a coronary artery with a blood clot. It is a type of myocardial infarction. It may or may not be a result of atherosclerosis.

Epidemiological data have provided much of what we know about risk factors in coronary heart disease. It appears that many factors interact to produce a coronary-prone individual. The American Heart Association's statement on "Risk Factors and Coronary Disease" describes the factors known to be associated with the risk of future coronary disease. The ones that *cannot* be modified include:

- *sex* (men are more susceptible than premenopausal women. After the age of menopause, there is no difference)
- *age* (Middle aged are most susceptible)
- *heredity* (There seems to be an inherited tendency to CHD)

Other risk factors which may be difficult to adjust include:

- *underlying disease* (diabetics have an increased risk of CHD)
- *stress* (emotional stress seems to increase risk)
- *personality traits* (the ambitious, hard-driving, aggressive, slavish to deadlines, etc., are more prone.)

Still other risk factors which are more amenable to alteration are:

- *dietary factors*, including dietary intake of excess fat and carbohydrates
- *hypertension* --- hypertensive individuals run greater risk
- *obesity* --- overweight individuals run a greater risk than normal or underweight persons
- *exercise* --- sedentary individuals run a greater risk
- *smoking* --- cigarette smokers are more prone to CHD than nonsmokers

There seems to be an interaction effect among these factors; no one factor alone will explain the difference in susceptibility to CHD among populations.

The dietary characteristics which are considered as possible risk factors for CHD are:

- *Overconsumption of food*. The death rate of obese people is higher than that of people of the same age who are not obese. The greater mortality is in part due to death from CHD. Obesity is associated with physical under-activity, high blood pressure and diabetes, each of which is considered to be an important risk factor for CHD. There is evidence that a substantial reduction in the body weight of obese persons alone is sufficient to diminish the high death rate associated with obesity.
- *Excess of dietary fat and a low ratio of polyunsaturated to saturated fats in the diet*. The results of comparative studies of the population of various countries demonstrate that, in general, the death rate from CHD correlates positively with the average proportion of food energy which is derived from fat, especially when saturated fats make up most of the fat in the diet. Saturated fats are fats which, in general, are solid at room temperature and usually come from animal sources. Some examples of sources of saturated fats are: beef suet, red meats, egg yoke, dairy fat, and poultry. A high intake of saturated fats tends to raise blood cholesterol levels. Unsaturated fats, or polyunsaturated

fats, are those which in general are liquid (oils) at room temperature and usually come from plant sources. Some examples of unsaturated vegetable fats are: peanut, soybean, cottonseed, corn, and safflower oils. Coconut oil is an exception. It is a saturated fat.

While dietary manipulation may offer one way of treating and/or preventing CHD, it is clear that diet alone is not sufficient. Epidemiological data show that other factors operate strongly. For example, among the Masai and Somali nomads in East Africa, young adult men eat virtually nothing but meat and milk --- a diet very high in fat and saturated fat. Yet CHD is almost unknown. These men get a great deal of physical exercise and almost no one is overweight. Exercise and weight control seem to be important factors also.

- *Excess intake of dietary cholesterol*. In certain animal species a diet rich in cholesterol induces the appearance of arterial lesions which have some similarity to those seen in human subjects. Comparative studies of different human populations show that those which have a diet rich in cholesterol have a higher death rate from CHD than those with less cholesterol in their diet. However, a diet rich in cholesterol is usually one which is also rich in saturated fats. A high concentration of serum cholesterol and, in addition to or alternatively, a high concentration of serum triglyceride (a fat) are two indicators of an increased risk of developing CHD that have been studied. It is not known whether blood cholesterol or blood triglyceride levels is the better predictor of CHD. Serum cholesterol and serum triglyceride both respond to changes in diet. Decreasing the amount of dietary cholesterol and saturated fat and increasing the amount of dietary unsaturated fat tends to lower serum cholesterol. Decreasing the amount of dietary sucrose tends to lower serum triglycerides. However, the role of fiber in the diet in lowering serum cholesterol is still being studied. Recent animal studies have shown that ingesting plant food lowers serum cholesterol while ingesting animal proteins raises serum cholesterol. Yet, whether altering one's diet to reduce serum cholesterol and triglycerides will substantially reduce an individual's susceptibility to CHD has not been established.
- *Excess of dietary sucrose*. Epidemiological studies give some indication that a population with a high sucrose intake has a high death rate from CHD. The correlation is even higher when the diet is also rich in saturated fats. However, the correlation between the death rate from CHD and the amount of saturated fat in the diet is higher than the correlation between death rate from CHD and the amount of dietary sucrose, although there are some interesting exceptions to this. For example, in Costa Rica, Cuba, Jamaica, Ecuador and Columbia --- countries in which the diet is of low energy content with a small proportion of saturated fats and a high sucrose content --- there is no relationship between the sucrose content of the diet and the death rate from CHD.
- *High consumption of salt*. A reduction in salt intake can, in some individuals, result in a lowering of blood pressure.

- *Deficiency of dietary fiber.* At present, the evidence which correlates a rise in the death rate from CHD to a reduction in the intake of dietary fiber is far from complete. (See the section on dietary fiber in "Areas of Current Investigation" on pages 100-101.)
- *"Softness" of the water supply.* During the past 15 years, investigators in several countries have observed a negative association between the "hardness" of the domestic water supply and the local death rate from cardiovascular disease. That is to say, the harder the water supply the lower the death rate from cardiovascular disease. The strongest negative correlation from cardiovascular disease is with the content of calcium in the drinking water; in other words, low CHD rates are associated with high content of calcium in the water.

National Nutrition Survey

In 1968, the U.S. Department of Health, Education, and Welfare began conducting a "National Nutrition Survey" as a comprehensive study to determine the nutritional status of families with incomes in the lowest quartile ($5,500 per year or less). Ideally, the survey was to represent 25% of the States' lowest income families with representatives from rural, urban, and semi-urban poverty areas. Only about 47% of the eligible families who were selected to participate actually did. Consequently, some caution must be exercised in interpreting these data because of the very high nonresponse rate. Clinical, dental, biochemical, and 24-hour recalls were the methods employed. The sampling was limited to ten states: California, Kentucky, Louisiana, Massachusetts, Michigan, New York (with a special survey in New York City), South Carolina, Washington, West Virginia, and Texas. The National Nutrition Survey was the first comprehensive nutritional status study done in the United States since *Nutritional Status USA*, published in 1959, which did not focus special attention on the low-income segment of the population.

Some of the major findings were that a higher incidence of nutritional deficiencies existed than had previously been thought. Specifically the presence of growth retardation, anemia, and goiter were often found. A few cases of rickets, protein-calorie malnutrition, and low vitamin A and C levels were found. Dental caries were extremely common. Also found was a correlation between the homemaker's educational level and the nutritional status of the children in the family. As the homemaker's educational level increased, evidence of nutritional problems in children decreased.

The National Nutrition Survey showed that hunger and malnutrition do exist in the United States. Many individuals manage, even with limited incomes, to maintain good nutritional health, but many do not. Programs are needed to improve this situation.

Samples of the population in low-income areas of the following counties in New York State were surveyed: Cattaraugus, Chautauqua, Chemung, Clinton, Erie, Greene, Herkimer, Jefferson, Lewis, Monroe, Niagara, Oneida, Onondaga, Orange, Rensselaer, St. Lawrence, Schenectady, Steuben, Suffolk, Sullivan, Tioga, Ulster, Washington, and Westchester.

PROGRAMS TO IMPROVE NUTRITIONAL WELL-BEING

Introduction

When federal food assistance programs were initiated, only 5.4 million persons used the Food Stamp and Commodity Distribution Programs and now 15 million participate. However, the number of persons in poverty started to increase in 1970 and has not declined since. Therefore, every poor American is not involved in a food assistance program. The Select Committee on Nutrition and Human Needs concluded that although some progress has been made, the hunger gap in the United States is far from closed.

Several government programs exist to help low-income Americans improve their nutritional well-being. The Food and Nutrition Service was established in August 1969 to concentrate on the administration of federal food programs. Historically, two alternative Food and Nutrition Service (FNS) programs - (1) Food Distribution, and (2) Food stamp - provided food assistance to low-income households. In fiscal year 1970, participation in the Food Stamp Program surpassed that of the Food Distribution Program for the first time.

In August 1973, Congress mandated adoption of food stamps nationwide and in most outlying territories. Nearly 99.6 percent of all persons receiving family food assistance in the fiscal year 1976 were food stamp users. The remaining 0.4 percent includes persons residing on Indian reservations and persons residing in the U.S. Trust Pacific Territories that were granted the option to continue food distribution until September 30, 1977.

Food distribution to needy families, formerly the major form of family food assistance, virtually ended in fiscal year 1975, as most remaining projects transferred to the Food Stamp Program.

Food Stamp Program

The Food Stamp Program is based on the assumption that it is better to help poor people buy food in grocery stores than to give them food directly. Initiated on a pilot basis in 1961, and enacted into the law in 1964, this program enables low-income households to improve their diets by supplementing their food buying power. Participants obtain a greater quantity and variety of food than they do in the Food Distribution Program. Eligible families receive stamps which they spend for food at participating stores. The amount that families pay for these stamps varies with family size and income. Families with little or no income do not have a purchase requirement and receive their stamps free.

Food stamps can buy:

- foods for human consumption
- seeds and plants which produce food for consumption by the eligible household

Food stamps *cannot* be used to pay for:

- alcoholic beverages and tobacco
- pet foods
- non-food items such as soaps, toothpaste, and household supplies
- prepared foods for consumption on the premises
- deposits on bottles or other containers

The Food Stamp Program offers the advantage of greater freedom of choice for the recipient in choosing what foods to buy. Food stamp allotments are adjusted semi-annually according to changes in food prices.

Women, Infants, and Children Supplemental Food Program (WIC)

Initiated in January, 1974, the WIC Program is federally supported and was established as an amendment to the Child Nutrition Act. WIC provides grants to state health departments and comparable agencies to provide specified nutritious food supplements, through participating health clinics, to pregnant and lactating women, and to infants and children up to five years of age who are at high risk of nutritional problems because of low income. The objective of the WIC Program is to lower the risks for nutritional problems and to lower medical risks by a combination of health care and nutritious food.

The National Nutrition Survey of 1969 and other studies would suggest that iron deficiency anemia, inadequate weight gain, and either very high or very low pre-pregnancy weights were prevalent among poverty women. Obviously these problems need to be remedied. Also, the overall quality of diet appeared to be low in pregnant women. For infants, Owen's Preschool Nutrition Survey suggests that failure to thrive, iron deficiency anemia, and perhaps other problems would need remedying in infants and young children. Dietary values for a number of other vitamins and minerals also were low in the poverty groups studied.

Expanded Nutrition Education Program (Federal Extension Service)

In the Winter of 1968-69, a nutrition education program for low-income groups was begun through the Cooperative Extension Service. This program employs nutrition aides from low-income areas to teach nutrition. The aides are given training in nutrition and related areas and are responsible for working with families on a one-to-one basis with support from the respective County Extension Home Economists. (Contact the County Extension Office for up-to-date information.)

Child Nutrition Programs

Through several child nutrition programs, Food and Nutrition Service (FNS) provides cash and food assistance to help support services for children in public and nonpublic schools, residential child care institutions, child care centers, settlement houses, summer camps, and recreation centers. The administration of child nutrition programs was substantially changed by Public Law 94-105, enacted October 7, 1975 which expanded their coverage to new outlets, liberalized eligibility standards, and mandated the service of reduced-priced meals in all participating schools.

The National School Lunch Program. Oldest and largest of the child nutrition programs, the National School Lunch Program, dates back to the National School Lunch Act of 1946. The program was designed to assist the states in establishing, maintaining, and expanding nonprofit lunch service in elementary and secondary schools. New Legislation in 1976 enlarged the definition of school to include licensed, public or nonprofit, private residential child care institutions, such as hospitals, juvenile detention centers, half-way houses, orphanages, and homes for the mentally retarded.

The National School Lunch Program is administered at the federal level by the United States Department of Agriculture Consumer and Marketing Service, and at the state level by the State Education Department. Lunches must meet an established nutritional standard.

In 1976, nearly 90,000 schools took part in this program. Thus, a school lunch program was available to 89.4 percent of the nation's school enrollment. The lunch program reached a larger number of needy children in 1976 than in any previous year, partly because of legislation liberalizing eligibility for reduced-price lunches and requiring that they be served in all participating schools.

School Breakfast Program. Through the School Breakfast Program the federal government provides cash and donated foods to states to assist in providing school breakfast service. Authorized on a limited basis in 1966, the School Breakfast Program was given permanent authorization in 1976 by legislation that required outreach efforts to make the program available where needed. It also redefined school to include licensed public or nonprofit private residential child care institutions. The program reached a record high, 2.3 million children in 1976, 15 percent more than the previous year. About 17,000 schools took part in the program.

Child Care Food Program. The Child Care Food Program, previously the year-round portion of the Special Food Service Program, was expanded by legislation enacted during 1976. The program primarily provides assistance for meal service for pre-school children in such nonprofit child care facilities as day care centers, settlement houses, Head Start centers, and family day care homes.

Summer Food Service Program for Children. The Summer Food Service Program for Children, previously the summer portion of the Special Food Service Program, was made available to new outlets by legislative changes during 1976. The program covers the cost of food service to needy areas for preschool and school-age children in nonprofit recreation centers, summer camps, or during vacations in areas operating under a continuous school calendar. All meals provided under this program are now served free of charge to the children.

Special Milk Program. The Special Milk Program reimburses schools, child care centers, settlement houses, and summer camps for part or all of the cost of milk served, and thus reduces the cost to the children. This program is especially important where there is no regular food service. Legislation enacted during 1976 made Puerto Rico, the Virgin Islands, American Samoa and the Pacific Trust Territories eligible for the milk program.

Non-Food Assistance Program. The Non-Food Assistance Program helps State educational agencies to finance food service equipment to enable schools in low income areas to establish, expand, and maintain food service programs. Schools receiving the aid must take part in the National School Lunch or School Breakfast Program.

GLOBAL NUTRITION: ECOLOGICAL PERSPECTIVES

Problems of Developing Nations

The world is substantially out of balance with respect to the production and distribution of food supplies. It has long been recognized that there are many agrarian nations whose production levels are low and who regularly fail to satisfy their respective basic food requirements. Most successful agriculture is practiced in temperate climates where soils are fertile, rainfall adequate, and growing conditions in general, favorable. Where the climate is harsh, water scarce, soils infertile and economic resources limited, agriculture tends to become a subsistence phenomenon. Where there are complications caused by periodic floods, droughts or other natural disasters, the situation worsens.

Widespread malnutrition in the developing areas of the world is compounded by disease and other factors to produce short life expectancy and poor general health for millions of people. Malnutrition may result from simple lack of enough food or from lack of specific nutrients --- protein, vitamins, or minerals. Most common are multiple deficiencies of protein and/or minerals. Rickets, scurvy, beriberi, pellagra, kwashiorkor, and marasmus are but a few of the many examples of vitamin and protein deficiency diseases.

When malnutrition begins at an early age and continues for a prolonged period of time, a variety of developmental defects may occur (involving bone and body structure and mental condition), all of which may be irreversible. Malnutrition may be aggravated by disease and parasitic infestation, unequal distribution of food among the population, and social customs which dictate the nutritional quality of the diet are two conditions that contribute to malnutrition. Malnutrition does not occur in isolation, but rather is interrelated with many other factors in the lives of people.

Population Growth

The population of the world is growing in geometric proportions. Most of the growth is concentrated in the areas of the world classified as "developing nations." The spectacular population growth can be accounted for by the fact that in most developing nations death rates have been decreasing, while birth rates have remained constant or have increased. The reduced death rates can be attributed largely to health campaigns and improved methods of preventing and treating diseases. Reduced death rates mean that people live to older ages and that fewer children die in infancy. This situation creates in developing countries, a typically young population --- often half the population is under 15 years of age. (By comparison, in the United States about 26 percent of the population is under 15 years of age.) A large portion of the population, therefore, is not engaged in productive work but does make demands on the resources of the nation.

Conservative estimates of world population figures are:

In 1830 - 1 billion people
In 1930 - 2 billion people
In 1960 - 3 billion people
In 1976 - 4 billion people
In 2000 - at least 6 billion people

In countries in which industrial and technological development took place slowly and over centuries (e.g., some Western European countries), the birth rate has gradually dropped off to almost parallel the death rate. During the 1970's, the birth rate in the United States started to decrease. Progress toward population stabilization is being made in other countries also. Taiwan and the People's Republic of China have made some progress in curbing the growth of their respective populations, but there are also many regions of the world in which definitive progress is not being made. Food production is not increasing at a rate sufficient to meet the demands of population growth, let alone correct existing problems of insufficient food. In developing countries, the population growth is greater and the increase in food production is smaller.

If the population stabilization occurs on an increasing scale, perhaps we can meet the problems of world nutrition. Fortunately, there is an enormous body of available information, a vast technology, improved biological materials, and an evergrowing cadre of qualified individuals who could give meaning and leadership to any national agricultural development plan. If each nation participates in a global effort to bring about the maximum efficient utilization of its agricultural and human resources for the production of food and agricultural commodities, it becomes possible to greatly increase total food production worldwide and to plan a system in which food production and distribution can be in harmony with human needs.

Urbanization

Often urbanization and technological development bring about a shift from subsistence agriculture or a very simple market economy to a complex cash economy. Systems of food transportation, processing, and marketing must be developed to feed urban populations. Individuals must have sufficient cash income to participate in the food marketing system by buying food. Urbanization and technological development also bring about exposure to advertising and to the customs of other people. Consequently, food habits and customs may change. One example is the growing number of women in the cities of developing countries who are abandoning the custom of breast feeding their infants in favor of bottle feeding with cow's milk preparations or synthetic substitutes. The health of the infants of these recently urbanized poor is jeopordized by this disruption of traditional custom. The cow's milk formulas are expensive and therefore are often diluted by the mothers. Sometimes these formulas are only sporadically available, and there is a high risk of contamination due to poor home hygiene. Thus, the high cost and ineffective use of these preparations often generate marasmus and diarrheal diseases in the first year of life.

Economic Growth

Economic growth can improve the average national nutrition but, at the same time, make the low income people worse off. As people's incomes rise, they generally desire more animal products. They take grain that had previously been used as food for the poor and use it as livestock feed. Whether these are the rich of the developed countries or of developing countries makes little difference to the poor. They only know the resulting hunger. The situation in which low income countries sell large amounts of protein to developed countries for feed while their populations have severe protein deficiencies illustrates the working of economic demand and supply with total disregard for the poor hungry people. Peru, for example, exports large amounts of fish products for

livestock feed to Europe and the United States. Lower income people of Peru simply do not have effective ways to compete with incomes of the people of the United States. A parallel situation has been the export of United States' food products while portions of our own population are inadequately fed.

Malnutrition in Children

The most crucial nutritional problem in the developing countries is that of protein-caloric malnutrition in children. It is difficult to obtain specific statistics on the incidence of protein-calorie malnutrition in children because vital statistics often do not reflect this information. The malnourished child may die of measles or diarrhea, and the death will be recorded under that disease without recognition of the role of malnutrition as a contributing factor to the death. In some countries, deaths of children under one or two years of age are not even recorded.

Infants and children are especially vulnerable to malnutrition because of their relatively high nutrient needs and the high proportion of inadequate diets. Although children over a year old aren't growing as fast as they did in infancy, they are still growing rapidly and need sufficient calories, protein, and other nutrients to provide for their growth. Since the malnourished child is probably highly susceptible to a variety of infections, diseases and parasites, there is a vicious cycle which accentuates the already precarious nutritional state. After the children are weaned from the breast, they are often not fed the full complement of foods available to the family because, in some cultures, it is believed that some foods are not good for children. Often a child receives cereals and gruels even if the rest of the family has access to high protein foods and vegetables. The preschool child is in one of the most difficult of all population groups to reach with nutrition programs in developing countries. Once in school, school breakfast and lunch programs may help.

The extreme forms of malnutrition in developing nations are marasmus, kwashiorkor, and marasmic kwashiorkor. These conditions, although affecting a large number of children, represent only a fraction of the total population at risk (i.e., those children who do not display the overt signs of deficiency). *Marasmus* is a condition which results from a deficient intake of both protein and calories. The term "marasmus" was first used by child psychologists to describe extreme emaciation and growth failure associated with emotional deprivation. In simple terms, nutritional marasmus represents starvation. These children do not grow normally, and become very thin, wasted and apathetic. They are very susceptible to infection and disease. Most commonly, nutritional marasmus occurs when breast feeding is discontinued early with no adequate food substitute available. In older infants and children, marasmus sometimes develops when breast feeding is continued for a long time, but supplementary foods are not given.

Kwashiorkor occurs when protein intake is deficient but calorie intake is relatively adequate. Most commonly, kwashiorkor develops when an older child is abruptly weaned from the breast because of the birth of a sibling, or because of the onset of pregnancy in the mother. Typically, the child is given a diet consisting mainly of starchy gruels with very little else. The child may derive sufficient calories from this diet, but protein needs will not be met. The kwashiorkor child develops edema, hair and skin changes, growth failure, and manifests general apathy. The word "kwashiorkor" comes from an

African dialect which means, "the disease of the child who is displaced from the breast." The condition is so common in many places that it is regarded as an inevitable disease of childhood. *Marasmic Kwashiorkor* represents the situation in which both calorie and protein intake are inadequate.

The effects of protein-calorie malnutrition in children are extremely serious. The mortality rate from malnutrition and from infectious disease is high in many developing nations in the preschool age group. Recent surveys have demonstrated that the frequency and severity of oral problems among children in developing countries are related to gross malnutrition and to infectious disease episodes.

The effects of early malnutrition on mental and intellectual development are not very well understood. There is some possibility that early and severe malnutrition may affect brain function and development. The extent, how, and whether the damage is permanent is still being investigated. The results of recent studies demonstrate that there is a reduction in head size as a result of infantile malnutrition which is associated with an increase of skull transillumination and width of the lateral ventricles. With treatment, these indices of brain size tend to return to normal, some taking as long as six months to do so. These studies indicate that some changes occur in the cranial contents during infantile malnutrition, which seem to be reversible with treatment.

Some studies indicate that young children with a history of severe malnutrition in infancy may have fewer and smaller brain cells than their well-nourished counterparts. However, do smaller brains caused by malnutrition signify less intelligence? Some studies have reported that malnourished children develop cognitive skills at slower than normal rates.

Studies should be done to determine the extent to which malnutrition contributes to the depressed cognitive development that is observed in previously malnourished children. Because malnourished children are ill most of the time, they have little opportunity to learn and may not be able to learn at appropriate times in their development. They are also raised in an impoverished environment where psychological and intellectual stimuli are minimal. Some experts believe that the delays in cognitive development may be due to the depressed environment in which malnourished children live. It is very difficult to separate the effects of malnutrition from the effects of environment.

A very common vitamin deficiency found in developing nations is vitamin A deficiency. Severe and prolonged vitamin A deficiency leads to keratomalacia and eventually permanent blindness. Keratomalacia is characterized by a softening of the cornea of the eye. In many countries where fruits and vegetables are "low prestige foods" or considered unsuitable for children, vitamin A deficiency is common. Niacin, thiamine, and riboflavin deficiencies are also common in many regions where food production and distribution systems are primitive, and famine is a common occurrence. Goiter, caused by a deficiency of iodine, and folic acid or iron deficiency anemia are also common health problems in developing nations.

Feeding the World's Population

There are complex dimensions to the world food crisis; (1) the effects of famine which we have witnessed in countries such as Bangladesh and Ethiopia, where extreme food shortages have caused illness and death, and (2) the world food crisis exemplified by the malnourished state of many people of the world due to the increasing population growth and static food production. The problem of providing food for all of the world is one of the primary challenges before us today. The economic, agricultural, and human situations vary in different parts of the world and the problem is of such great magnitude and complexity that it must be attacked from many angles simultaneously.

The Role of International Agencies

International agencies became especially concerned with nutrition and food after World War II when many countries were severely damaged in terms of food supply and agricultural productivity. The United Nations Relief and Rehabilitation Administration (UNRRA) was established in 1946 by 44 member governments, and helped alleviate the crisis in 17 nations ravaged by the war. UNRRA organized shipments of surplus products (mostly wheat) and attacked agricultural problems. UNRRA has since been replaced by other UN agencies with longterm goals and programs. These agencies of the United Nations have responsibility for helping to solve nutrition problems. The principal ones are FAO (Food and Agriculture Organization), WHO (World Health Organization), UNICEF (United Nations International Children's Emergency Fund), and UNESCO (United Nations Economic, Social, and Cultural Organization).

International organizations can:

- o provide technical assistance to member nations (experts and consultants on a permanent basis, or for specific projects)
- o furnish equipment
- o provide fellowships for study
- o arrange and sponsor conferences, and technical and scientific meetings
- o set up training centers and advise on education programs
- o facilitate the transport and use of surplus foods

International agencies have limitations in their crusades against malnutrition. Programs of these agencies can operate only at the request of the host government. Surpluses, technical assistance, and other help may be accepted or rejected at various times. Government priorities also dictate the extent of the financial support given to these agencies. For these agencies to succeed, it is important that the leaders of all countries collaborate in resolving nutrition problems in spite of political differences.

World Food Conference

The Director-General of Food and Agricultural Organization (FAO) called a World Food Conference in November of 1974 in Rome, Italy. The purpose of this Conference was to initiate some collective action in finding solutions to the problem of world hunger. Some of the recommendations and outcomes of the Conference are:

- Increased food production is essential in both developed and developing areas. In the case of many developing countries, a reordering of programs, priorities, and farmer incentives is required to stimulate production.
- Beginning in 1975, food aid donor countries were urged to make all efforts to provide commodities and/or financial assistance to ensure at least 10 million tons of grain per year as food aid.
- The FAO undertaking for international cooperation in establishing a world network of national grain reserves was endorsed.
- A global Information and Early Warning System on Food and Agriculture, which is essential to the whole objective of improved food security around the world was established.
- The need for eliminating trade barriers was stressed.
- The establishment of a World Food Council, an organization to have coordinating, consultative and advisory powers with respect to food aid, investment, and other foreign assistance was approved.
- Governments were asked to include nutrition education in school curricula at all grade levels.

Domestic Resources

There is need to improve farming techniques in order to increase productivity. Careful planning is needed to open new lands to cultivation where possible and to plant appropriate crops to maximize return for invested money and labor. Although animal protein foods are lacking in the diets of many millions of people, care should be taken in turning land from rice or other grain production to raising livestock. This is because the return in terms of food energy is greater when grain is grown. It is estimated that seven times as many calories are produced by growing grain as are produced by raising livestock on the same amount of land. In other words, the same area yields 7,000 "original calories" of grain as compared to 1,000 calories of livestock products. Where land is scarce, and the population dense, this consideration of maximum yield is critical.

Improved farming methods, such as the use of hybridized seed, fertilizer, water supplies, appropriate use of machinery and better storage and marketing facilities, can provide many times the amount of food currently produced in the world. That technical skills do exist is shown by the history of the United States agriculture. A century ago, an American farmer produced enough food for five people. Today, he produces enough for 39 people. In the last 20 years in the United States, livestock production per acre has increased 40 percent. The application of known skills to solving world food problems depends on the resources that people, governments, and international organizations, bring to bear on the problem.

New Food Products. Efforts are underway to produce new foods of high protein content and high quality. The development of new foods, and the discovery of the merits of foods previously not included in the diet, such as the soybean, are helping to provide more high quality protein sources. However, to meet human needs for new foods, the product must meet a number of criteria:

- Materials should be available locally.
- Materials needed to produce the food must not already be used maximally for human food.
- The product must be within the economic means of the population.

- o The product should be easy to transport and store without refrigeration.
- o The product should be safe.
- o The product should provide needed protein.
- o The product should be acceptable to the people who are to eat it.
- o The product should fulfill a need, want and/or demand.

Trained Personnel. The need for trained personnel in both developing and developed countries to carry out basic research, to provide consultation services, to hold policy-making posts, and to conduct nutrition education programs is great. Educational fellowships and programs in agriculture, nutrition, medicine, education, and the basic sciences are urgently needed.

If the problems of feeding the world's population adequately are to be resolved, it will take the dedicated efforts of many trained individuals. There are a variety of careers and occupations that provide opportunities for contributing to the solution of these problems. The following occupations all have responsibility for some aspects of nutrition: agricultural specialist, chemist, dental hygienist, dentist, dietary technician, dietitian, farmer, food service manager, food technologist, health educator, home economist, home health aide, nurse, nutritionist, occupational therapist, physician, social worker, sociologist and teachers at all grade levels.

NUTRITION RESEARCH

Introduction

Research into the role of nutrition in specific aspects of health and disease is continuing, involving the efforts of many scientists and nutritionists. The body of knowledge available in the area of nutrition is increasing rapidly. New discoveries are made almost daily. By discussion some of the unanswered questions in nutrition and the methods used to find the answers, it is expected that students will be in a better position to evaluate new information as it becomes available.

Methods

A variety of methods are employed to study nutrition. All are based on the "scientific method" --- experimentation and collection of information with careful attention to research methodology.

Animal Studies. Because of the basic similarities in the physiology and biochemistry of all animals, nutrition studies using laboratory animals form the basis for much work in human nutrition. White rats are the most common laboratory animal used for nutrition studies because of their short life span allowing studies to be made on several generations over a relatively short period of time, and the relative ease of keeping and breeding them in the laboratory. Other animals are also used, including guinea pigs, mice, gerbils, pigs, chicks, dogs, and monkeys.

There are differences in nutritional requirements and metabolism for different species. For diverse species, guinea pigs, as do people, require vitamin C in their diet, but most other animals can synthesize vitamin C in their bodies. Results from experiments on animals cannot be directly applied to humans, but such studies do form a valuable basis for subsequent studies on other species or with human subjects.

For some studies when scientists wish to rule out all effects of bacteria in the animal, "germ-free" animals are used. These animals are born by Caesarean section under aseptic conditions and reared in a completely sterile environment.

Universities, research centers, and other legitimate research operations obtain their experimental animals from reputable animal supply houses, and the animals are treated humanely. In properly conducted research, animals are not subjected to unnecessary pain or discomfort. When animals must be killed in the course of an experiment, it is done quickly and humanely. From time to time ardent antivivisectionist groups mount ill-advised campaigns to bar all medical experimental use of animals. Such a stand is unreasonable when one realizes the great benefits to human life that have been derived directly or indirectly through animal research and evaluation.

Epidemiological Studies. The epidemiologist, a person who studies the distribution of disease in populations, plays an important role in nutrition research. By studying statistics on large populations of people, it is possible to obtain clues to causes or preventive factors in disease, including dietary patterns. For example, much of what we know about possible causes of coronary heart disease is the result of the study of epidemiological data---telling us in what populations the heart disease rate is high and in what populations it is low. The differences in the way of life and environment of these populations can be compared, providing clues for further research with animals and/or human subjects as a means of minimizing the disease.

Clinical Studies. Studies accomplished by manipulating the diets of human subjects and then observing their reactions to the diet are the most conclusive type of study. They are also the most expensive, time-consuming, and difficult to do. Usually extensive physiological and biochemical measurements are made, and studies must continue over a period of weeks or even months to be successful. Subjects must be cooperative and eat nothing except the diet given them. They must also cooperate in collecting urine and fecal matter for study, in having blood samples drawn, and in any other measurements required.

Sociocultural Studies. Recently a new area of nutritional investigation has come into being: an area sometimes called "Social Nutrition." Many nutritionists and social scientists are engaged in trying to find out more about why people eat as they do. The methods of the social scientist are being applied to the study of eating patterns and food habits.

Areas of Current Investigation

There are still many unanswered questions in the field of nutrition. A few of the areas in which there is a great deal of current interest and investigation are:

Dietary Fiber. In recent years, a number of reports have appeared describing the role fiber can play in preserving health and preventing disease. It has been suggested that appendicitis, diverticular disease of the colon, benign and malignant tumors of the large bowel, ulcerative colitis, varicose veins, hemorrhoids, hiatus hernia, gallstones, ischemic heart disease, diabetes, obesity, dental caries, periodontal disease, and duodenal ulcer are caused by "fiber deficiency."

Fiber is the stringy or strand-like substance surrounding the cell walls of plants. The chemical composition of fiber varies depending on the particular plant, but it generally includes cellulose, hemicellulose and lignin. All plants, and only plants, contain fiber. Nuts, fruits and vegetables are good sources of fiber. Whole grain breads, other cereal products, and bran which is the outermost covering of the wheat grain, are excellent sources of fiber. Fiber is indigestible --- not metabolized --- by the body. The problem in interpreting research data is to distinguish which class of compounds is responsible for the observed result. Claims that have been made for fiber may actually be true only for certain fibers or even for certain fiber components.

It is generally agreed that fibrous materials have the ability to increase the bulk of feces by absorbing water from other substances in the digestive tract. Fecal bulk has been shown to be correlated with transit time through the digestive tract; the bulkier the feces, the more rapidly it is excreted. It is this rapid transit time associated with dietary fiber that plays a role in the claim that fiber prevents the development of cancer of the colon and rectum. However, research thus far has shown no relationship between transit times and the incidence of colon cancer in Western populations, i.e., constipated persons do not have more of such cancers than nonconstipated persons. The incidence of colon cancer throughout the world has been shown to be more highly correlated with high intake of dietary fat and protein than with low intake of fiber. Also, the incidence of coronary heart disease is more highly correlated with excessive amounts of animal fat in the diet than with a low fiber diet. Obviously, fiber is not a single factor at work in disease prevention.

Dietary fiber also has been credited with lowering the concentration of cholesterol in the bloodstream and thus decreasing the incidence of atherosclerosis and heart disease. In an experiment with baboons, a test group was fed a low fiber diet, while the control groups received a high fiber diet. The test groups began showing elevated serum cholesterol levels, but the control group did not. The proposed mechanism for this lowering of cholesterol involved the binding of fiber to bile acids and bile salts in the colon and then excretion of these complexes in the feces. Bile acids which are not excreted return to the liver. Some cholesterol synthesized in the liver is also converted to bile acids and the rest is released into the bloodstream. A higher rate of bile acid excretion means that more of the cholesterol synthesized in the liver must be used to replace the excreted material and that less of it goes into the bloodstream. However, experiments have shown that different fibers display different binding characteristics and that bran has no effect whatsoever on the serum cholesterol level. Thus, whether a person can lower his/her cholesterol by eating fibrous substances is still unclear.

Until more research is completed, the enthusiasm of most nutritionists for increased dietary intake of fiber is restrained. We could probably use a little more fiber in our diets, but excessive intakes may produce a new set of health problems. Excessive fiber intake can mean the loss of important nutrients. Increased fiber in the diet of animals has been shown to induce caloric inefficiency. This may be good for humans up to a point, but in animals, the increased fiber also binds minerals such as zinc, copper, iron, and perhaps, magnesium. The high fiber diets of some peoples in Africa and India are associated with a high incidence of mineral imbalance and kidney stones. It is possible for this to happen if people treat fiber as a remedy for all ills instead of recognizing it as merely a normal part of the human diet.

Diet and Cancer. Diet has been thought to play important roles in determining whether or not some people develop cancer. In recent years, several specific relationships between diet and cancer have been more intensively studied. Some of this exciting new information suggests that in the reasonably near future we may be able to decrease our risk of cancer by eating the right diet.

Even though these dietary and nutritional relationships to cancer are becoming more evident, more research is needed before it will be possible to make exacting recommendations on which diet is best. Claims have been made that vitamin A, fiber, and vitamin C are cancer inhibitors, while excessive cholesterol, beef fat, calories and protein in our diets may each increase the probability of certain types of cancer. Several laboratories in the United States and Europe have demonstrated a very high correlation between dietary intake of animal fats and cancer of the colon, breast, and prostate. These findings have led to several theories that attempt to explain this role of dietary lipids (fat). One of the most popular theories suggests that prolonged, high intakes of beef and certain other meats give rise to gastrointestinal organisms in the large bowel that are said to release bile acids and other bile salt derivatives that either promote or induce tumor formation. However, considerable caution and additional research are required before such information produces specific recommendations.

The role of specific nutrients in cancer susceptibility is but one dimension of the diet-nutrition-cancer triangle. Another is that our food and water supplies may harbor cancer-causing chemicals. Ingested chemicals already proven to be carcinogenic, at least under experimental conditions, now number in the hundreds. Most of these are synthetic chemicals derived from our expanding agricultural and industrial technologies. Chemicals proven to be carcinogenic have been used in commerce as intentional food additives or drugs. DES (diethylstilbestrol), cyclamates, saccharin and red dye food colors have earned notoriety because experimental data have implicated them as carcinogens.

Natural compounds can also be carcinogenic. Of these, the aflatoxins, which are poisonous substances produced by the fungus Aspergillus flavus, are potent liver carcinogens. Another group of chemicals in the cancer chain are the nitrates. Although otherwise naturally occurring, their high concentration in certain soils results from intensive agricultural fertilization. Nitrates are not carcinogenic, but upon ingestion they are reduced to nitrites that combine with secondary amines common in foods to form the carcinogenic nitrosamines. This seems to be true also of sodium nitrate (added to meats as a preservative and to enhance red color), when it combines with other chemical compounds in the body to produce nitrosamines.

The probability of tumor production has been estimated both from experimental animal work and by demographic data on human cancer incidence. What is known to date clearly demonstrates that nutritional status and dietary habits are major factors in determining the individual's susceptibility to cancer. More research must be directed toward the effects of nutrient intakes on the cancer process. In the case of protein intake, for example, it has been shown that rats fed about half the dietary protein normally required for good growth do not develop liver tumors from the potent liver carcinogen aflatoxin compared to animals fed normal levels of dietary protein. More research is needed before we know whether the specific intake of protein is too high in much of our population. If dietary protein affects aflatoxin liver cancer in this way, then we know we may encounter rather far-reaching consequences for other nutrients and other cancers.

Megavitamin Therapy. Megavitamin therapy or orthomolecular treatment is defined by Linus-Pauling as the preservation of good health and the treatment of disease by increasing the concentrations in the human body of substances that are normally present in the body and that are required for health. Proponents of megavitamin therapy have proposed that large doses of niacin could cure schizophrenia. The American Psychiatric Association established a special task force to examine the conclusions of both the orthomolecular psychiatrist and the validity of independent studies to determine the facts. The task force could find no known basis for the biochemical theories of the megavitamin proponents. In those cases where success had been attributed to megavitamins, the task force found imprecise diagnosis of schizophrenia, contradictory results from study to study, and questionable methodology.

Another form of megavitamin therapy has been advocated by Linus Pauling. In his 1970 book, *Vitamin C and the Common Cold,* and in his 1976 follow-up version, *Vitamin C, the Common Cold and the Flu,* he states that large daily doses of vitamin C (250 gm to 5 gm) will offer protection from the common cold and that larger doses (5 gm to 20 gms per day) taken at the first sign that a cold is developing will relieve its symptoms. This hypothesis has prompted several studies in an effort to prove or disprove the effects of vitamin C on the common cold.

A group of scientists at the University of Toronto organized a clinical trial that tested the claim that 1000 mg (1 gm) of vitamin C a day would lead to 45 percent fewer colds and 60 percent fewer days of sickness. During the winter of 1972-73, half the subjects in this experiment received a regular daily intake of 1000 mg of vitamin C and the other half a placebo. Also, an increase in the daily dose to 4 gm during the first three days of any illness was given to the vitamin C group. The trial ran for 14 weeks. When the results were analyzed, the investigators found that there were no significant differences between the two groups in the number of days symptoms were present or in the number of episodes of illness. However, there was a significant difference in the amount of disability experienced by the two groups. The vitamin C group had recorded fewer days "confined to the house" than the placebo group. These results suggest that the extra vitamin C is not protecting against infection directly, or just helping to dry up nasal secretions, but rather is helping the victim to overcome the general feeling of "malaise" that often accompanies an acute infection, and is probably part of a nonspecific reaction to stress. These results are only tentative and further research is needed to determine the efficacy and safety of pharmacologic doses of vitamin C in the treatment of the common cold.

Currently, research is being done to determine what effects, if any, vitamin C has in lowering blood cholesterol levels and in reducing the impact of cancer. However, we do not have results from concentrated clinical trials to prove or disprove these theories as yet. Until these are forthcoming, the safest procedure is to follow current nutritional guidelines and include plenty of fresh fruit and vegetables in the diet. People who choose to experiment with higher doses, in the thousands of milligrams per day, should be aware of the potential hazards of side-effects, such as increased incidence of kidney stones which increase with dose and duration. Also, if a person has been on high doses for more than one or two weeks, the body will become tolerant to the high dose and will need to be "weaned" off slowly to avoid a rebound drop of vitamin C in the blood.

Ongoing Research

The Multiple Risk Factor Intervention Trial (MRFIT) is assessing (1) the effect of reducing elevated blood cholesterol levels, (2) high blood pressure, and (3) cigarette smoking in preventing first heart attacks and reducing death rates from cardiovascular disease. The study is supported by the National Heart and Lung Institute, National Institutes of Health. Screening and enrollment of men between the ages of 35-57 to take part in this six-year study began in 1974. The goal of MRFIT is to answer the question as yet unanswered by direct experimentation: "Can the reduction of these three common risk factors for coronary heart disease prevent or reduce the incidence of heart attacks and premature death in a high risk segment of the United States population?"

Only East Finland has a higher incidence of heart disease than the United States. A five-year program of preventive medicine involving the whole population of 180,000 in North Karelia has decreased heart disease significantly. The heart attack rate for males dropped 40 percent during a five-year period. Measures were taken to reduce elevated blood cholesterol, high blood pressure, and cigarette smoking. This was accomplished by decreasing the amount of saturated fat and cholesterol and increasing the amount of fresh vegetables in the diet, by decreasing the amount of smoking, and by earlier detection of high blood pressure followed by treatment.

Recommendations. Evidence indicates that the formation of atherosclerotic lesions (plaques) often begins early in life. Thus, habits that work against the development of CHD (exercise, weight control, refraining from smoking, sensible diet) should be formed early rather than started in a "crash" basis in middle age, especially for the individual who may have inherited a tendency to develop CHD. However, it should be pointed out that professional and official organizations have not agreed on the best recommendations to make. The American Heart Association has outlined a program recommended for the general population for decreasing animal (saturated) fat consumption and increasing unsaturated fats in the diet, decreasing dietary cholesterol and reducing overweight. However, the American Medical Association and the National Research Council have been more conservative in their approach, recommending such modification as therapeutic measures for patients with CHD, but not feeling that the evidence is sufficient to recommend drastic changes in the diet for the general population who have not been diagnosed as having CHD.

It appears that a diet low in saturated fat may help to prevent the development of atherosclerosis, but exercise, not smoking, and maintenance of normal weight may be even more important. More research remains to be done before all the answers are in.

Changes Needed in Food Selection and Preparation

1. Increase consumption of fruits and vegetables and whole grains.

2. Decrease consumption of refined and other processed sugars and foods high in such sugars.

3. Decrease consumption of foods high in total fat, and partially replace saturated fats, whether obtained from animal or vegetable sources, with polyunsaturated fats.

4. Decrease consumption of animal fat, and choose meats, poultry and fish which will reduce saturated fat intake.

5. Except for young children, substitute low-fat and non-fat milk for whole milk, and low-fat dairy products for high fat dairy products.

6. Decrease consumption of butterfat, eggs and other high cholesterol sources. Some consideration should be given to easing the cholesterol goal for pre-menopausal women, young children and the elderly in order to obtain the nutritional benefits of eggs in the diet.

7. Decrease consumption of salt and foods high in salt content.

(See Appendix C for more detailed recommendations.)

PART SIX

APPENDIXES

*** PRIMARY SOURCES OF ASSISTANCE ***

*** SOME COMMON MISCONCEPTIONS ABOUT FOOD ***

*** A SUMMARY OF THE DIETARY GOALS FOR THE UNITED STATES ***

APPENDIX A

Sources of Nutrition Education Materials

Cooperative Extension Offices

Each county in New York State has a Cooperative Extension Office. The cooperative extension agents can provide a variety of material aids to assist you in implementing a quality nutrition education program. They also can provide human resources and consultation. Consult the telephone directory for the office in your county.

Dairy Council Offices

Seven Dairy Councils, staffed with professionally trained nutritionists, service all of New York State. The Councils provide education programs, materials, and consultation services for schools. The following are the Dairy Council offices serving New York State.

- Dairy, Food and Nutrition Council, Inc.
  Commerce Building, 678 Troy-Schenectady Road
  Latham, New York 12110
  (518) 785-5441

- Dairy, Food and Nutrition Council. Inc.
  834 Front Street
  Binghamton, New York 13905
  (607) 724-7598

- Dairy, Food and Nutrition Council, Inc.
  Executive Towers; 201 South Avenue
  Poughkeepsie, New York 12602
  (914) 452-5630

- Dairy, Food and Nutrition Council, Inc.
  840 James Street
  Syracuse, New York 13203
  (315) 475-2721

- Dairy Council of Niagara Frontier Area
  2451 Wehrle Drive
  Buffalo, New York 14221
  (716) 634-1080

- Dairy Council of Metropolitan New York, Inc.
  60 East 42nd Street
  New York, New York 10017
  (212) 682-7961

- Dairy Council of Rochester Area, Inc.
  73 Halstead Street
  Rochester, New York 14610
  (716) 288-1758

Consumer Information Center

The Consumer Information Center located at Pueblo, Colorado 81009 has available a variety of materials on nutrition. Some are free while others are inexpensive. Write for their catalogue at the above address.

New York State Department of Health

The New York State Department of Health has several regional offices which have nutritionists on their staffs. These nutritionists can provide consultation, sources of the latest nutrition research and information, and materials that can be used in nutrition education programs. The regional offices are as follows:

- New York State Department of Health
  Rochester Regional Office
  1475 Winton Road North
  Rochester, New York 14609

- New York State Department of Health
  Albany Regional Office
  Taxation and Finance; Building 9
  State Campus
  Albany, New York 12226

- New York State Department of Health
  Syracuse Regional Office
  677 South Salina Street
  Syracuse, New York 13202

- New York State Department of Health
  White Plains Regional Office
  901 North Broadway
  White Plains, New York 10603

- New York State Department of Health
  Buffalo Regional Office
  584 Delaware
  Buffalo, New York 14202

In addition to the Regional Offices, the Department of Health maintains a Bureau of Nutrition. Its address is:

- New York State Department of Health
  Bureau of Nutrition, Tower Building
  Empire State Plaza
  Albany, New York 12237

New York City

For the New York City area, assistance can be obtained through

- The City of New York
  Department of Health, Bureau of Nutrition
  93 Worth Street
  New York, New York 10013

United States Department of Agriculture

The United States Department of Agriculture produces a variety of publications on various aspects of foods and nutrition. For further information write:

- Office of Information
  U.S. Department of Agriculture
  Washington, D.C. 20250

Printed and audiovisual materials are available to special groups through:

- Food and Nutrition Information and Educational Materials Center
  Room 304
  National Agricultural Library
  Beltsville, Maryland 20705

APPENDIX B

Some Common Misconceptions About Food and Nutrition

Children and youth acquire many misconceptions about foods and nutrition in the home, from their peers, and from the media. Some of these misconceptions frequently become the basis for food quacks and faddists. It is important that learners recognize the important nutrition misconceptions and understand that they may contain an element of truth but broad conclusions can be erroneous. Learners should also recognize that not everything is known about nutrition and fad diets are sometimes based upon these gaps in scientific knowledge. Some of the common misconceptions about food and nutrition that the learners should become familiar with follow.

1. *Natural vitamins are superior to synthetic vitamins.*

   The truth is that synthetic vitamins manufactured in the laboratory are identical to the natural vitamins found in foods. The body gets the same benefits from either source.

2. *Vitamins provide extra pep and energy.*

   The truth is that vitamins will not provide extra pep and vitality beyond normal expectations, or an unusual level of well-being. Energy foods; i.e., carbohydrates and fats are the best source of energy. Vitamins cannot be oxidized as energy sources, but rather, they act as catalysts. Vitamins, unless sugar-coated, contain no energy-producing nutrients.

3. *Vitamins taken in amounts greater than those required by the body will provide an extra margin of safety.*

   The truth is that the belief that, "If a little is good, a lot must be better, and it certainly can't hurt," is not true. Research now indicates that taking large vitamin doses may have serious side-effects and may even destroy other vitamins in the process. Vitamins A and D have known toxic effects. Bone fragility, thickening of long bones, loss of appetite, coarsening and loss of hair, enlargement of liver and spleen, irritability, double vision, skin rashes, and stunted growth are among the symptoms of *prolonged, excessive* vitamin A intake. Excessive vitamin D intake over a long period of time causes excessive calcification of bone and calcification of soft tissue (kidney and lungs), encourages formation of kidney stones, headaches, nausea, diarrhea, bone fragility and retarded growth.

4. *Raw foods are more healthful than cooked foods.*

   The truth is that when foods are properly prepared most of the nutrients are retained. Some foods containing vitamin C, for example, if over-cooked or cooked with too much water, will destroy the vitamin C content. Raw cabbage, for instance, contains more vitamin C than boiled cabbage.

5. *Raw milk is more healthful than pasteurized milk.*

   The truth is that only the vitamin C in raw milk is lost during pasteurization. Milk is *not* a rich source of vitamin C to begin with. With this exception, pasteurized milk is equally nutritious as raw milk.

6. *Athletes must eat large quantities of meat.*

   The truth is that athletes need the same nutrients as anyone else. Eating large quantities of meat will not increase musculature or endurance. Athletes may need more energy-producing foods as a result of increased activity associated with the sport.

7. *Fish is a brain food.*

   The truth is that no food is a special food for any part of the body. The phosphorus in fish is no different from that found in meat, milk and vegetables and will be used by other tissues needing phosphorus as well as the brain.

8. *Yogurt possesses special healthful nutrients.*

   The truth is that yogurt contains the same nutrients as the milk from which it is made.

9. *For increased sexual potency one should eat oysters, olives, raw eggs, etc.*

   The truth is that there is no known food that has any influence on sexual potency.

10. *White hen's eggs are more nutritious than brown hen's eggs.*

    The truth is that there is no scientific evidence that the color of an egg has any bearing on its nutritive value. The color of the egg is influenced by the breed of hen; the White Leghorn lays white eggs, the Plymouth Rock lays brown eggs.

11. *Eating onions (or garlic) will cure a cold.*

    The truth is that the pungent odor of onions or garlic may momentarily clear the nasal passages by stimulating the secretions from the mucous glands; it has no known medicinal value.

12. *Depletion of the soil has resulted in inferior vegetables and fruits*

    The truth is that the quality of soil has very little effect on the quality of the fruits and vegetables grown on it. Soils that are depleted will influence significantly the yield. However, with the use of synthetic fertilizers during the past 50 years, soils can be restored quickly and yields maintained.

13. *People should eat the foods they crave to insure an adequate diet.*

The truth is that cravings for foods are more related to one's appetite than to the body's needs for nutrients. We tend to crave foods that we find pleasant and that tend to satisfy our appetite.

14. *A pregnant woman must eat for two.*

The truth is that although there is a need to increase nutrient intake for the woman's needs and the developing fetus, no time during pregnancy does the increased need for nutrients exceed about 50 percent. For example, her need for calories increases only about 10 percent in the second trimester and an additional 10 percent in the final trimester of pregnancy.

APPENDIX C

A Summary of the Dietary Goals for the United States

Introduction

The dietary goals for the United States were prepared by the Select Committee on Nutrition and Human Needs of the United States Senate. Senator George McGovern chaired this committee and the initial report was issued in January, 1977. In December, 1977 a revised report was released. The following summary is based on the latest, revised report.

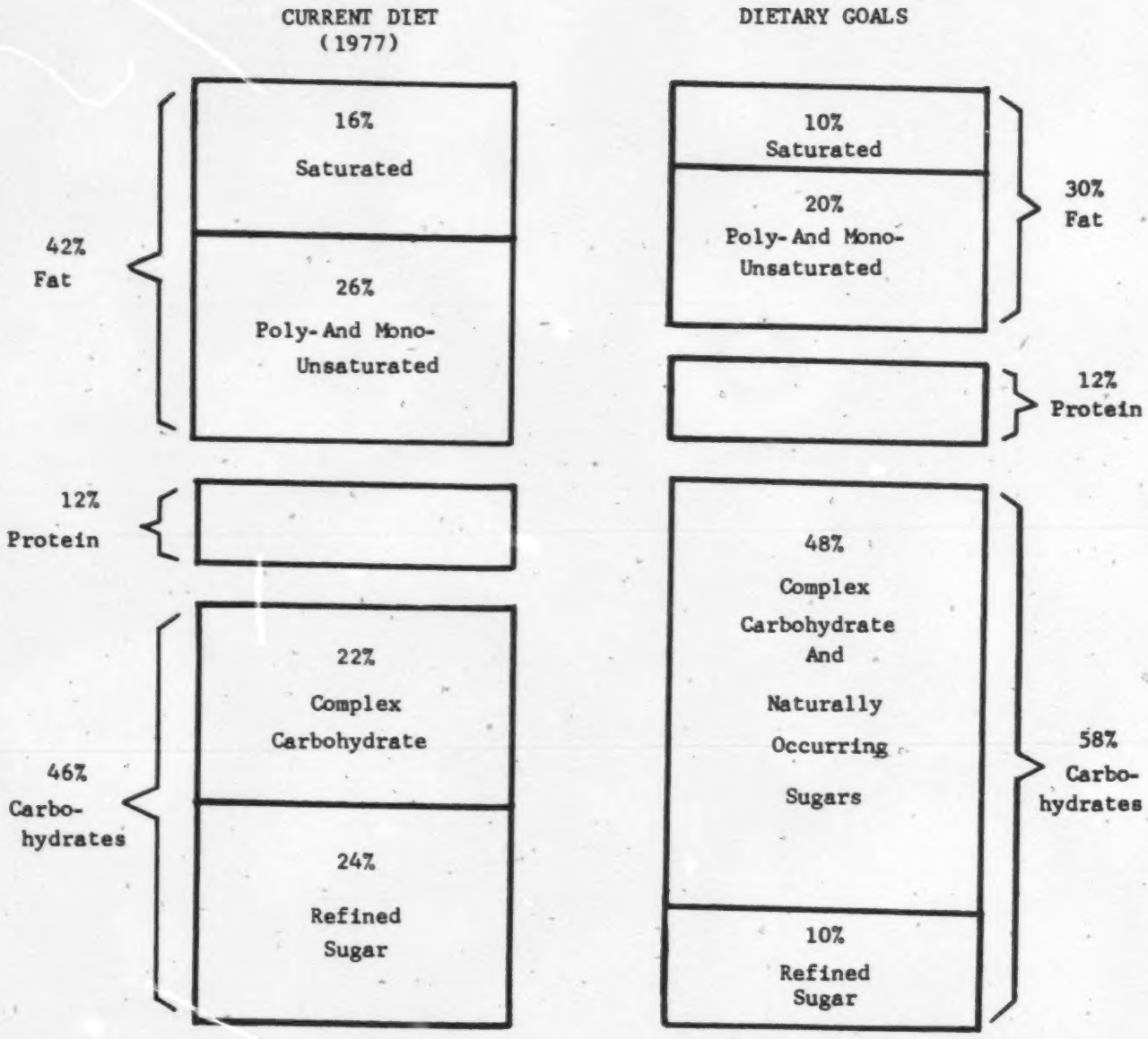
The United States Dietary Goals

1. To avoid overweight, consume only as much energy (calories) as is expended; if overweight, decrease energy intake and increase energy expenditure.
2. Increase the consumption of complex carbohydrates and "naturally occurring" sugar from about 28 percent of energy intake to about 48 percent of energy intake.
3. Reduce the consumption of refined and processed sugars by about 45 percent to account for about 10 percent of total energy intake.
4. Reduce overall fat consumption from approximately 40 percent to about 30 percent of energy intake.
5. Reduce saturated fat consumption to account for about 10 percent of total energy intake; and balance that with polyunsaturated and mono-unsaturated fats, which should account for about 10 percent of energy intake each.
6. Reduce cholesterol consumption to about 300 mg a day.
7. Limit the intake of sodium by reducing the intake of salt to about 5 gram a day.

Changes in Food Selection and Preparation

1. *Increase* consumption of fruits and vegetables and whole grains.
2. *Decrease* consumption of refined and other processed sugars and food high in such sugars.
3. *Decrease* consumption of foods high in total fat, and partially replace saturated fats, whether obtained from animals or vegetable sources, with polyunsaturated fats.
4. *Decrease* consumption of animal fat, and choose meats, poultry and fish which will reduce saturated fat intake.
5. Except for children, substitute low-fat and nonfat milk for whole milk, and low-fat dairy products for high-fat dairy products.
6. *Decrease* consumption of butterfat, eggs, and other high cholesterol sources. Some consideration should be given to easing the cholesterol goal for premenopausal women, children, and the elderly in order to obtain the nutritional benefits of eggs in the diet.
7. *Decrease* consumption of salt and foods high in salt content.

CONTRAST OF CURRENT DIET WITH DIETARY GOALS



Source: Dietary Goals For The United States, Senate Select Committee on Nutrition and Human Needs, 2nd Ed., 1977.